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NATIVE TREES *of* CANADA

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NATIVE TREES OF CANADA

INTRODUCTION

This book was first published by the Forest Service in 1917 and reprinted in 1921 to supply in more or less popular form descriptions of the characteristics and uses of the trees indigenous to Canada. It was written by B. R. Morton, B.Sc.F., with notes on nomenclature and utilization by R. G. Lewis, B.Sc.F. To these gentlemen credit is still due for their painstaking work, much of which is still preserved in the present bulletin. The demand has been so great that the second impression of the first edition has become exhausted; hence a new edition has become necessary. Some revision has been made in the nomenclature and in the descriptions of the qualities and uses of the woods, based on information which has become available since the first publication.

The descriptions have been confined almost entirely to those features by which the trees may be most readily recognized in the field and, in order that the book may best serve its purpose, terms which are unfamiliar to one who has not made a study of botany have been avoided as much as possible. Those desiring more complete and scientific descriptions may find them in the books listed at the close of this introduction.

The species included are limited to those which grow in tree form in some part of their natural range in Canada, though several of those described, such as the speckled alder, mountain birch, and witch hazel, are found ordinarily only as shrubs. Exotic species, such as Norway spruce, Scots pine, and Norway maple, have been omitted, though they may be of common occurrence in Canada.

The region in which each species occurs naturally in Canada is indicated in the text and in some cases is shown by hatched areas on accompanying maps. It is not claimed that these descriptions or maps are absolutely accurate, as the precise distribution of some species has not as yet been finally determined, but they are based on the reports of botanists, foresters, explorers, surveyors, and others who have observed their occurrence, supplemented to some extent by a knowledge of the soil and climatic conditions suitable for the growth of the tree. The range as given indicates the geographic limits within which the tree may be found, but within that range the occurrence of the species is usually restricted to certain sites determined by the composition of the soil, water supply, temperature, exposure, and other factors of environment.

The province of Ontario, especially that portion of it forming the peninsula enclosed by the Great Lakes, possesses a greater variety of tree species than any other part of the Dominion. Here are found species of trees which occur nowhere else in Canada. Trees such as the tulip, chestnut, black gum, papaw, flowering dogwood, and others characteristic of the forests of Ohio and other states to the south, reach their northern limits here. Similarly in the province of British Columbia, the mild and humid climate of the southern coast, Vancouver island, and portions of the Columbia and Kootenay valleys permits the occurrence of many species which are typical of more southern forests and which are not found elsewhere in Canada.

The drawings herein were made by Mr. Morton, for the most part from specimens in the collection of the Faculty of Forestry of the University of Toronto; to this institution thanks are due for the use of its collection. The Forest Service is indebted also to Prof. John Davidson, of the Department of

Botany of the University of British Columbia, and to the Forest Branch of the Department of Lands of the province of British Columbia for information regarding trees native to that province.

Nomenclature

The scientific names used in this book are those which in the judgment of eminent botanists conform to the code laid down by the International Botanical Congress held in Vienna in 1905 and amended by subsequent International Botanical Congresses. The name (usually abbreviated) of the botanist who first assigned the name is given after the scientific name. Historical botanical research and the discovery of new distinctions of species sometimes necessitate the discarding of names which have been in common use for many years in favour of names which have priority under the International code. Outstanding instances, in the present edition, are the changing of *Picea canadensis* to *Picea glauca* and *Quercus rubra* to *Quercus borealis*.

The principle followed in selecting the common names has been to adopt the name in most general use in Canada, unless there is some good reason for using another. An example of the latter is the adoption of "ponderosa pine" in place of "Western yellow pine," which latter has certainly been more generally used in British Columbia. By far the greatest supply of this wood is in the United States, and, since the United States Forest Service and the timber trade in that country have accepted "ponderosa pine" as the official name, it is obviously desirable that a similar course should be pursued here.

The name "paper birch" used in the previous edition of this book has been changed to "white birch," since the latter is used almost exclusively throughout the Dominion.

In the case of *Pinus resinosa* the name "red pine" was chosen in preference to "Norway pine," because the former relates to the natural colour of the wood of the species, which is darker than white pine, while the latter name is misleading, as the species is not native to Norway.

In a number of cases preference has been given, in the choice of the English name, to names which are translations of the botanical names, as in the case of the limber pine (*Pinus flexilis*). In some cases the adjective "Western" is added to the name in order to differentiate species found in Western Canada (e.g., Western hemlock, Western white pine), although locally that adjective may not be used.

Special effort is made in the choice of names to remedy duplication that may exist. For example, two distinct species, *Carpinus caroliniana* and *Ostrya virginiana*, are both often designated, locally, as "ironwood," "hornbeam," and "hop hornbeam" without distinction. As *Carpinus caroliniana*, however, is often called "blue beech"—a name never applied to *Ostrya virginiana*—this name was adopted as the English name for *Carpinus caroliniana*, and "ironwood" applied to *Ostrya virginiana*.

Other common names of occasional or local use are listed for the purpose of assisting readers to recognize the species, but it is hoped that by giving official recognition to one common name for each species, these names will ultimately become standardized. By this means much confusion in the trade will be obviated, and architects, builders, and other users of wood will be able to specify the wood of a certain species without liability to misunderstanding.

The use of the common names that are marked by an asterisk should be avoided. In most cases the names so marked are used to designate two or more entirely different trees; in the other cases some other inconsistency in use renders the name objectionable.

List of Books for Further Reference

Those desiring further information regarding the botany or dendrology of trees described in this volume will find them taken up in the following:

Gray's New Manual of Botany, seventh edition, edited by Professors B. L. Robinson and M. L. Fernald. 1908.

Silva of North America, 14 volumes, 1890-1902, by Charles Sprague Sargent, Director, Arnold Arboretum, Harvard University.

Manual of the Trees of North America, by C. S. Sargent, second edn., 1922.

Check List of the Forest Trees of the United States, by Geo. B. Sudworth, Dendrologist, United States Forest Service. 1927.

Manual of Cultivated Trees and Shrubs, by Alfred Rehder, Arnold Arboretum, Harvard University. 1927.

Conifers, Junipers, and Yew: Gymnosperms of British Columbia, by Professor John Davidson, Department of Botany, University of British Columbia. 1927.

The Forest Trees of Ontario, by Prof. J. H. White, Faculty of Forestry, University of Toronto. 1925.

The Nomenclature of Canadian Trees

CONIFEROUS SPECIES

Botanical Name	*English Name*	*French Name*
Pinus Strobus L.	White pine	Pin blanc
" *monticola* Dougl.	Western white pine	Pin argenté
" *flexilis* James	Limber pine	Pin blanc de l'Ouest
" *albicaulis* Engelm.	White-bark pine	Pin à blanche écorce
" *resinosa* Ait.	Red pine	Pin rouge
" *Banksiana* Lamb.	Jack pine	Pin gris
" *rigida* Mill.	Pitch pine	Pin dur
" *ponderosa* Dougl.	Ponderosa pine	Pin à bois lourd
" *contorta* Dougl.	Shore pine	
" *contorta* Dougl. var. *latifolia* Engelm.	Lodgepole pine	Pin de Murray
Larix laricina (Du Roi) K. Koch.	Tamarack	Mélèze
" *occidentalis* Nutt.	Western larch	Mélèze occidental
" *Lyallii* Parl.	Alpine larch	Mélèze de Lyall
Picea mariana (Mill.) B.S.P.	Black spruce	Epinette noire
" *rubra* Link.	Red spruce	Epinette rouge
" *glauca* Voss	White spruce	Epinette blanche
" *glauca* Voss var. *albertiana* Sarg.	Western white spruce	
" *Engelmanni* Engelm.	Engelmann spruce	Epinette d'Engelmann
" *sitchensis* (Bong.) Carr.	Sitka spruce	Epinette de Sitka
Tsuga canadensis (L.) Carr.	Eastern hemlock	Pruche
" *heterophylla* (Raf.) Sarg.	Western hemlock	Pruche (tsuga) de l'Ouest
" *Mertensiana* (Bong.) Sarg.	Mountain hemlock	Tsuga de Patton
Pseudotsuga taxifolia (Lamb.) Brit.	Douglas fir	Sapin de Douglas
Abies balsamea (L.) Mill.	Balsam fir	Sapin baumier
" *lasiocarpa* (Hook.) Nutt.	Alpine fir	Sapin concolore
" *grandis* Lindl.	Grand fir	Sapin grandissime
" *amabilis* (Dougl.) Forbes	Amabilis fir	Sapin gracieux
Thuja occidentalis L.	Eastern white cedar	Thuya (Cèdre de l'Est)
" *plicata* D. Don	Western red cedar	Thuya géant
Chamaecyparis nootkatensis (Lamb.) Spach	Yellow cedar	Cyprès jaune
Juniperus virginiana L.	Red juniper	Génévrier rouge
" *scopulorum* Sarg.	Rocky Mt. juniper	Génévrier des montagnes Rocheuses
Taxus brevifolia Nutt.	Western yew	If occidental

BROAD-LEAVED SPECIES

Botanical Name	*English Name*	*French Name*
Salix sp.	Willow	Saule
Populus tremuloides Michx.	Aspen	Tremble
" *grandidentata* Michx.	Large-toothed aspen	Grand tremble
" *balsamifera* Du Roi	Balsam poplar	Peuplier baumier
" *acuminata* Rydb.	Lance-leaf cottonwood	Peuplier à feuilles acuminées
" *angustifolia* James	Narrow-leaf cottonwood	Peuplier à feuilles élancées
" *deltoides* Marsh.	Cottonwood	Liard
" *trichocarpa* Torr. & Gray	Black cottonwood	Peuplier de l'Ouest
Juglans nigra L.	Black walnut	Noyer noir d'Amérique
" *cinerea* L.	Butternut	Noyer cendré
Carya cordiformis (Wang.) K. Koch	Bitternut hickory	Carya amer
" *ovata* (Mill.) K. Koch	Shagbark hickory	Carya blanc
" *alba* (L.) K. Koch	Mockernut hickory	Carya tomenteux
" *glabra* (Mill.) Sweet	Pignut hickory	Carya glabre
Ostrya virginiana (Mill.) K. Koch	Ironwood	Ostryer de Virginie
Carpinus caroliniana Walt.	Blue beech	Charme d'Amérique
Betula populifolia Marsh.	Wire birch	Bouleau gris
" *papyrifera* Marsh.	White birch	Bouleau blanc
" *papyrifera* Marsh. var. *occidentalis* (Hooker) Sarg.	Western white birch	Bouleau occidental
" *lutea* Michx.	Yellow birch	Merisier
" *lenta* L.	Sweet birch	Bouleau merisier
" *alaskana* Sarg.	Alaska birch	Bouleau d'Alaska
" *fontinalis* Sarg.	Mountain birch	Bouleau fontinal
Alnus incana (L.) Muench.	Speckled alder	Aune commun
" *rubra* Bong.	Red alder	Aune de l'Orégon
" *sinuata* Rydb.	Sitka alder	Aune de Sitka
" *tenuifolia* Nutt.	Mountain alder	Aune ténuifolié
Fagus grandifolia Ehrh.	Beech	Hêtre
Castanea dentata (Marsh.) Borkh.	Chestnut	Châtaignier d'Amérique
Quercus alba L.	White oak	Chêne blanc
" *Garryana* Doug.	Garry oak	Chêne de Garry
" *stellata* Wang.	Post oak	Chêne à lobes obtus
" *bicolor* Willd.	Swamp white oak	Chêne bicolore
" *macrocarpa* Michx.	Bur oak	Chêne à gros glands
" *Muehlenbergii* Engelm.	Chinquapin oak	Chêne à chinquapin
" *montana* Willd.	Chestnut oak	Chêne prin
" *velutina* Lam.	Black oak	Chêne des teinturiers
" *borealis* Michx.	Red oak	Chêne rouge
" *palustris* (L.) Muench.	Pin oak	Chêne des marais
" *coccinea* Muench.	Scarlet oak	Chêne écarlate
Ulmus fulva Michx.	Slippery elm	Orme rouge
" *americana* L.	White elm	Orme blanc
" *racemosa* Thomas	Rock elm	Orme liège
Celtis occidentalis L.	Hackberry	Micocoulier occidental
Morus rubra L.	Red mulberry	Murier rouge
Magnolia acuminata L.	Cucumber tree	Magnolia à feuilles acuminées
Liriodendron Tulipifera L.	Tulip tree	Tulipier
Asimina triloba Dunal	Papaw	Asiminier trilobé
Sassafras variifolium (Salisb.) Ktze.	Sassafras	Sassafras
Hamamelis virginiana L.	Witch hazel	Hamamélis de Virginie
Platanus occidentalis L.	Sycamore	Platane d'Occident
Sorbus americana Marsh.	Mountain ash	Cormier
" *sitchensis* Roem.	Western mountain ash	Cormier de l'Ouest
" *occidentalis* Greene		
Malus glaucescens Rehd.	Wild crab-apple	
Amelanchier canadensis (L.) Medic.	Service-berry	Amélanchier du Canada
" *alnifolia* Nutt.	Saskatoon	Amélanchier à feuilles d'aulne
Crataegus sp.	Hawthorn	Aubépine

BROAD-LEAVED SPECIES—*Concluded*

Botanical Name	*English Name*	*French Name*
Prunus nigra Ait.	Canada plum	Prunier canadien
" *emarginata* Walp.	Bitter cherry	Cerisier amer
" *americana* Marsh.	Wild plum	Prunier d'Amérique
" *pennsylvanica* L.	Pin cherry	Petit merisier
" *virginiana* L.	Choke cherry	Cerisier à grappes
" *virginiana* L. var. *demissa* Torr.	Western choke cherry	Cerisier sauvage de l'Ouest
" *serotina* Ehrh.	Black cherry	Cerisier tardif
Cercis canadensis L.	Redbud	Gainier du Canada
Gymnocladus dioica (L.) K Koch	Kentucky coffee-tree	Chicot du Canada
Gleditsia triacanthos L.	Honey locust	Févier à trois épines
Ptelea trifoliata L.	Hop-tree	
Rhus typhina L.	Staghorn sumach	Sumac amaranthe
Acer spicatum Lam.	Mountain maple	Erable bâtard
" *pennsylvanicum* L.	Striped maple	Bois barré
" *macrophyllum* Pursh	Broad-leaved maple	Erable à grandes feuilles
" *circinatum* Pursh	Vine maple	Erable circiné
" *glabrum* Torr. var. *Douglasii* Dipp.	Dwarf maple	Erable nain
" *saccharum* Marsh.	Sugar maple	Erable à sucre
" *saccharinum* L.	Silver maple	Erable blanc
" *rubrum* L.	Red maple	Erable rouge
" *Negundo* L.	Manitoba maple	Erable négundo
" *nigrum* Michx.	Black maple	Erable noir
Tilia glabra Vent.	Basswood	Tilleul d'Amérique
Cornus florida L.	Flowering dogwood	Cornouiller de la Floride
" *Nuttallii* Aud.	Western dogwood	Cornouiller de Nuttall
" *alternifolia* L.	Alternate-leaved dogwood	Cornouiller à feuilles alternes
" *asperifolia* Michx.	Rough-leaved dogwood	
Nyssa sylvatica Marsh.	Black gum	Nyssa sylvestre
Arbutus Menziesii Pursh	Madrona	Arbousier de Menzies
Fraxinus quadrangulata Michx.	Blue ash	Frêne anguleux
" *nigra* Marsh.	Black ash	Frêne noir
" *americana* L.	White ash	Frêne blanc
" *pennsylvanica* Marsh.	Red ash	Frêne rouge
" *pennsylvanica* Marsh. var. *lanceolata* (Borkh.) Sarg.	Green ash	Frêne vert
Rhamnus Purshiana DC.	Cascara	Nerprun

CHANGES IN NOMENCLATURE IN THIS BULLETIN

The following changes in names of tree species in this revised edition of the present bulletin will be noted:—

ENGLISH NAMES

White-barked Pine to White-bark Pine
Western Yellow Pine to Ponderosa Pine
Hemlock to Eastern Hemlock
Black Hemlock to Mountain Hemlock
Lowland Fir to Grand Fir
Cedar to Eastern White Cedar
Western Cedar to Western Red Cedar
Yellow Cypress to Yellow Cedar
White Birch to Wire Birch
Paper Birch to White Birch
Western Birch to Western White Birch
Red Elm to Slippery Elm
Bird Cherry to Pin Cherry

BOTANICAL NAMES

Pinus Murrayana to *Pinus contorta* var. *latifolia*
Picea canadensis to *Picea glauca*
Pseudotsuga mucronata to *Pseudotsuga taxifolia*
Betula alba var. *papyrifera* to *Betula papyrifera*
Betula occidentalis to *Betula papyrifera* var. *occidentalis*
Alnus oregona to *Alnus rubra*
Alnus sitchensis to *Alnus sinuata*
Quercus prinus to *Quercus montana*
Quercus rubra to *Quercus borealis*
Pyrus americana to *Sorbus americana*
Prunus demissa to *Prunus virginiana* var. *demissa*
Acer Douglasii to *Acer glabrum* var. *Douglasii*
Tilia americana to *Tilia glabra*

FRENCH NAMES

Pin à feuilles rigides to Pin dur
Tamarac to Mélèze
Tsuga de l'Ouest to Pruche (Tsuga) de l'Ouest
Orme bâtard to Micocoulier occidental
Faux bananier to Asiminier trilobé
Erable dur to Erable à sucre
Bois blanc to Tilleul d'Amérique

CONIFEROUS SPECIES

THE PINES

The pines (*Pinus*) are widely distributed throughout the northern hemisphere. Eighty species are known and thirty-five or so are found on this continent. Nine occur in Canada.

Three of our pines are found only in Eastern Canada, five in the West, and one species extends from the Atlantic to the Rocky mountains in British Columbia.

All pines are evergreens and have needle-like leaves which are clustered in bundles of from two to five. One species, not native, has solitary leaves. The leaves vary in length from one to fifteen inches.

The cone takes from two to three years to ripen. No cones ripen in less than two years.

The native pines are sometimes divided into two groups, the soft and the hard pines. The soft pines have their leaves in bundles of five and their cones are pendulous and have thin scales. The hard pines have their leaves in bundles of two or three and have cone scales which are quite thick and woody.

The soft pine group includes

White pine,	*Pinus Strobus*
Western white pine,	*Pinus monticola*
Limber pine,	*Pinus flexilis*
White-bark pine,	*Pinus albicaulis*

The hard pines are

Red pine,	*Pinus resinosa*
Jack pine,	*Pinus Banksiana*
Pitch pine,	*Pinus rigida*
Ponderosa pine,	*Pinus ponderosa*
Lodgepole pine,	*Pinus contorta* var. *latifolia*

Pinus Strobus L. **White Pine**

Other common names: Cork pine, Weymouth pine, pattern pine, sapling pine, pumpkin pine, Eastern white pine, yellow pine*, Quebec pine (England).

French names: Pin blanc, pin jaune*, pin potiron, pin Weymouth, pin baliveau, pin du lord.

This tree under favourable conditions sometimes reaches the height of 175 ft. and the diameter of 5 ft.; but in the average stand it is rarely found over 100 ft. high or more than 2 to 3 ft. in diameter. It is the tallest and most stately of all conifers in Eastern Canada.

It has the smoothest bark of any eastern pine. On limbs and young trunks under 6 in. in diameter it is, as a rule, greenish-brown in colour and quite smooth. Later it becomes roughened by shallow, flat-topped, broad, longitudinal ridges, greyish-brown in colour. On account of its thin, resinous bark it is greatly subject to damage by fire.

The branches usually grow out at right angles to the trunk in more or less regular whorls of five. On old trees, or those growing in crowded stands, this is not so apparent. The crown is more or less cone-shaped in young trees, becoming flat-topped when old.

PINE CONES AND LEAVES

1 White pine (*Pinus Strobus*). 2 Red pine (*Pinus resinosa*). 3 Lodgepole pine (*Pinus contorta* var. *latifolia*). 4 Pitch pine (*Pinus rigida*). 5 Jack pine (*Pinus Banksiana*). 6 Ponderosa pine (*Pinus ponderosa*). 7 Limber pine (*Pinus flexilis*). 8 Western white pine (*Pinus monticola*). 9 White-bark pine (*Pinus albicaulis*).

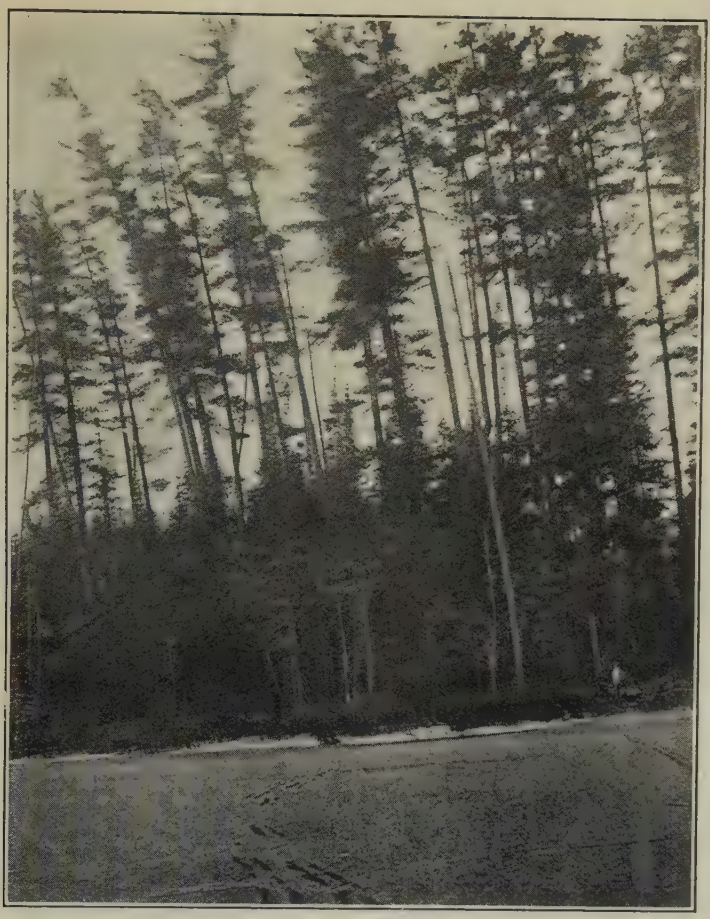


Photo. 11008. *R. H. Campbell.*

White pine *(Pinus Strobus).*

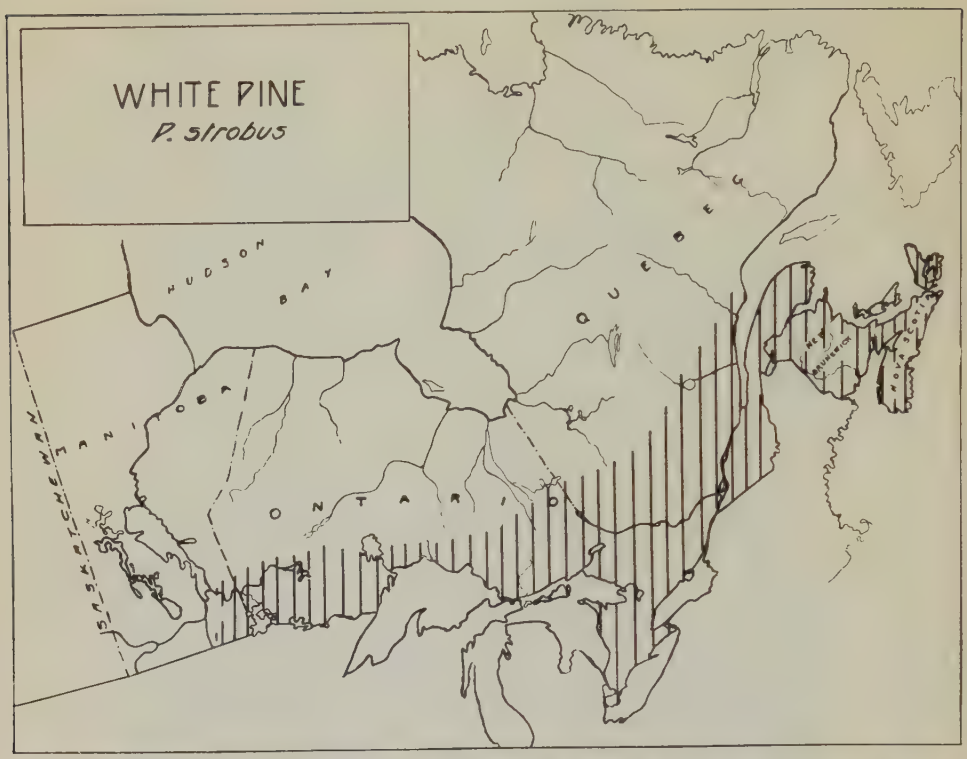
Its wide-spreading roots and deep tap-root make it very wind-firm and, as a rule, it is only the much-exposed mature trees that are overthrown.

The needle-like leaves grow in bundles of five and are from 3 to 5 in. long, soft, delicate, and of a clear light-green colour. In cross-section the leaves are triangular. It is the only native pine east of British Columbia with five leaves in a bundle, and is, therefore, not likely to be confused with any other.

The cones are from 5 to 10 in. long, slender, curved, and stalked. The scales are thin and have no prickles at their tips.

The white pine ranges from Newfoundland to Manitoba. Only in a few places (e.g., English river, lake Abitibi, and Matagami river) does it extend north of the height of land dividing the waters of the St. Lawrence and the Great Lakes from those of Hudson bay. Its best development as a timber tree is reached in the Great Lakes region and the valley of the Ottawa river, where it is frequently found in pure stands on sandy lands. It will grow well on either sand or clay, but does best on well-drained sandy lands.

For many years white pine was the most important timber tree in Canada, but for some time it has been exceeded in output by spruce and Douglas fir.



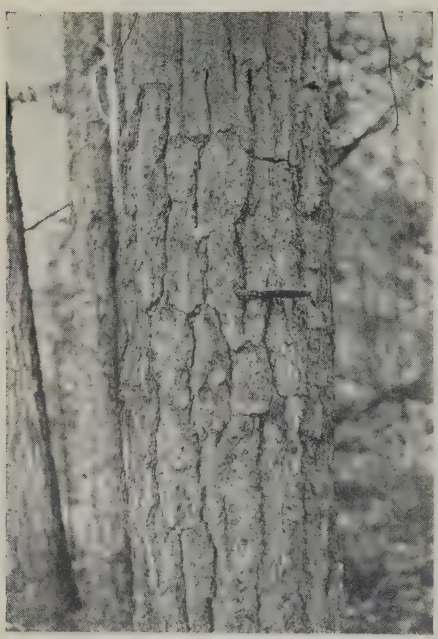
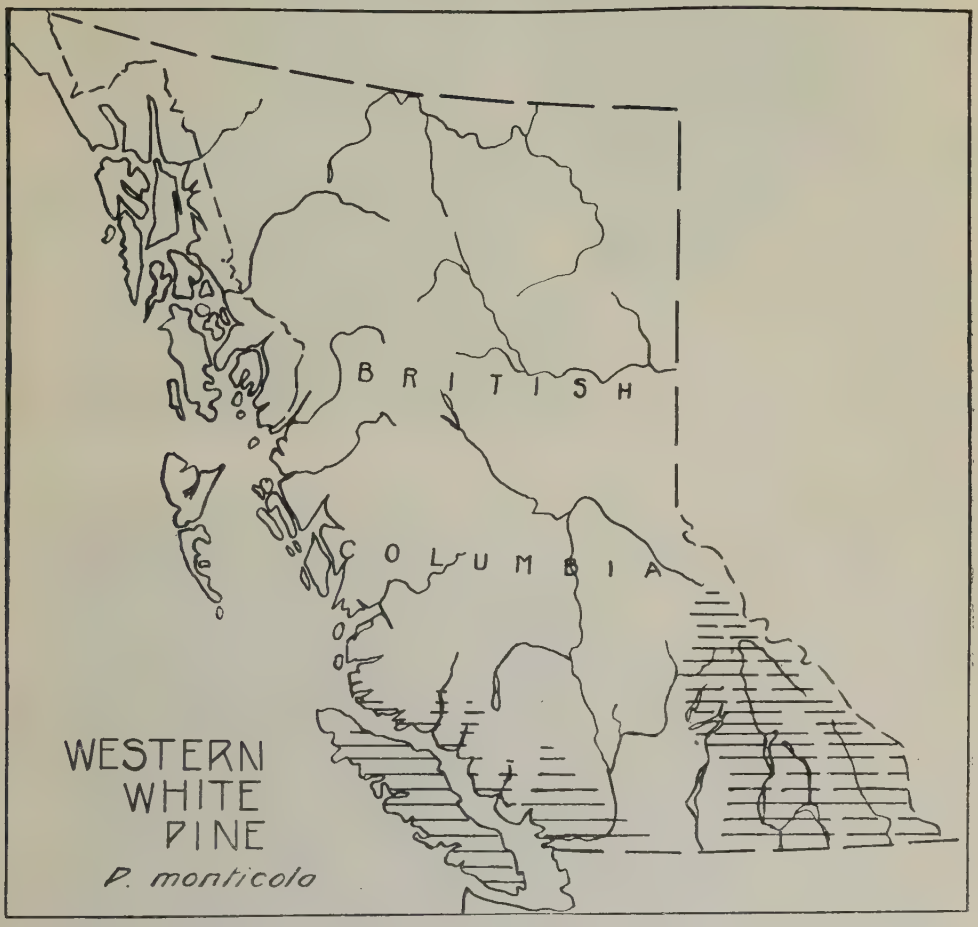


Photo. 8601. *B. R. Morton.*
White pine *(Pinus Strobus)*: trunk and bark

Photo. 331. *E. Stewart.*
Western white pine *(Pinus monticola)*: trunk and bark

Typical wood is uniformly light and soft, and on this account it is easily carved. It is subject to only comparatively slight shrinkage in drying. The wood is easily seasoned, holds its shape, and takes nails well. These characters and its easy working qualities make it most highly prized for pattern making and ornamental carving and as a wood of general utility.

The wood is well adapted for stain finishes. Because of its fine homogeneous structure and consequent stability, clear surfaces of white pine take paint well, and permit long-service life of paint coatings. It is used in every part of the construction of buildings, except for heavy structural purposes. A list of its other uses would include practically every wood-using industry in Canada.



Pinus monticola Dougl. **Western White Pine**

Other common names: Silver pine, mountain Weymouth pine, white pine (British Columbia).

French name: Pin argenté.

The height of the average Western white pine tree is about 125 ft. and its diameter about 2 ft. It occasionally reaches a diameter of 6 ft. and a height of 250 ft.

Photo. 5596. B. R. Morton.

Pitch pine *(Pinus rigida)*

Photo. 1350. A. Knechtel.

Limber pine *(Pinus flexilis)*

In dense stands it produces a tall, slender trunk and a narrow, conical crown of short, wide-spaced branches. The branches are usually slender and drooping, but when growing in the open a tree frequently extends one or more stout, horizontal branches 10 or 15 ft. beyond the others. This peculiar habit enables a person to distinguish the tree from a considerable distance.

The bark on young trees and branches is silvery-grey, thin, and smooth. On older trees it is purplish to brown and broken into square blocks about 1 in. thick. The inner bark has a cinnamon-red colour. Owing to the thinness of the bark the tree is easily damaged by fire.

Its fairly deep root-system protects it from serious injury by strong winds.

The leaves are bluish-green in colour and are borne in clusters of five. They are from 2 to 4 inches long and, as a rule, shorter, coarser, and stiffer than those of the white pine of the East. These two trees, having widely separated ranges, are not liable to be confused. The only other five-needled trees within the range of this tree are the limber pine and the white-bark pine. The general appearance of the Western white pine makes it easily distinguishable from these two trees. The leaves of the limber and white-bark pines are more clustered at the ends of the twigs. The cones of the latter two trees are different from those of the former, and the trees are usually found growing at a higher elevation than the Western white pine.

The cones of the Western white pine are from 6 to 18 in. long and very much larger than those of the white pine of the East, which they otherwise resemble.

The tree is found throughout the southern part of British Columbia. On the coast it is found on Vancouver island and the adjacent mainland. In the interior, it occurs in the valleys from the international boundary north to the big bend of the Columbia and Quesnel lake. It is seldom found at altitudes exceeding 2,500 feet on the coast, or 3,500 feet in the interior in British Columbia, though it grows at higher altitudes in the states to the south.

The wood of Western white pine is a trifle heavier and harder than that of the Eastern white pine but, in general, it is used for very similar purposes.

Pinus flexilis James **Limber Pine**

Other common name: Rocky Mountain pine.
French name: Pin blanc de l'Ouest.

The limber pine is a tree 25 to 40 ft. high and 12 to 24 in. in diameter. The trunk is short, thick, limby, and crooked and the crown is irregular, on account of the irregular whorls of thick limbs. Much of the limber pine growth is little better than shrubbery. In old trees the lower branches are very long and hang down. The young branches are exceedingly limber, hence the name. The wood is used locally only.

The bark on young trees and branches is whitish-grey and smooth. On trees over 12 in. in diameter it is dark brown, nearly 2 in. thick, and broken by deep fissures into irregular plates.

The leaves are borne in clusters of five and are 1½ to 3 in. long. They are dark green in colour, stout and rigid, and densely clustered at the ends of the branches.

The cones are 4 to 10 in. long and yellowish-brown in colour. The scales are very much thickened at the tips. This characteristic helps one to distinguish the tree from the Western white pine. At maturity the cones split open and the seed escapes. The colour of the cone also fades after a time.

This tree is found in Canada only in the Rocky mountains in southern British Columbia and Alberta, at an altitude of 5,000 to 6,000 ft. It usually occurs singly or in small stands. It is adapted to a great variety of soils, but is most often found on dry, rocky, and exposed slopes. In southern Alberta it is found on the tops of the foot-hills.

Pinus albicaulis Engelm. **White-bark Pine**

Other common names: White-stemmed pine, scrub pine.
French name: Pin à blanche écorce.

The white-bark pine is a small, scrubby tree, very much stunted, and in exposed sites is reduced almost to a creeping shrub. It sometimes reaches a height of 30 ft. and a diameter of 10 to 18 in. The crown is matted and the root-system spreading and strong. The wood is used only for firewood.

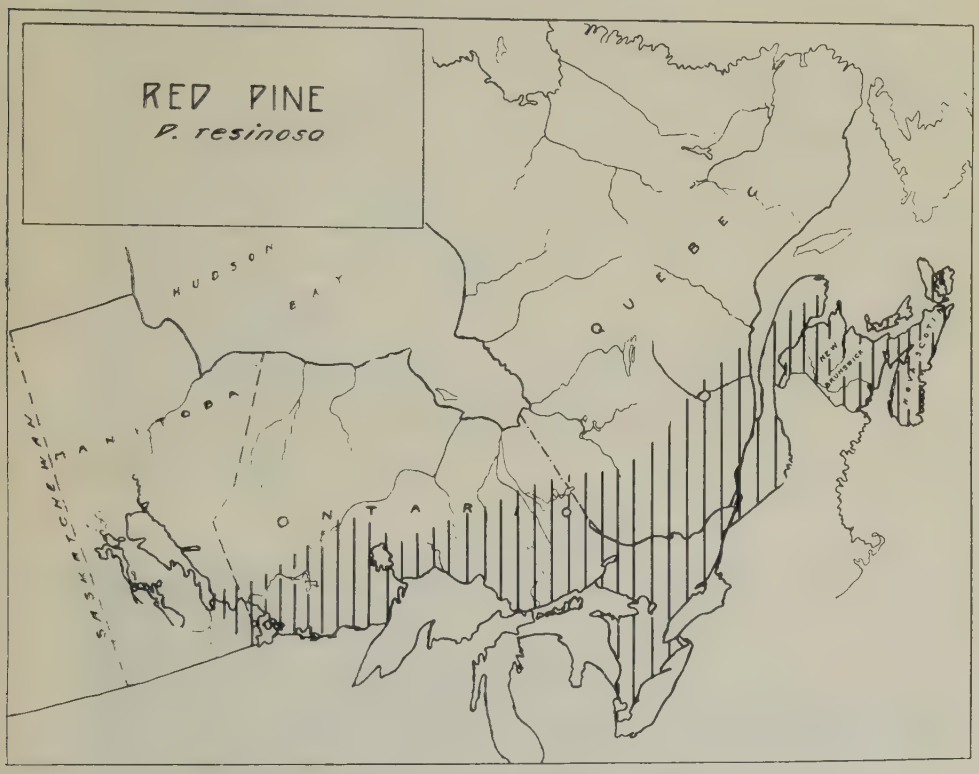
The bark is whitish and little broken except at the base of the trunk, where narrow cracks break it into whitish scales. It is rarely over $\frac{1}{4}$ in. thick.

The leaves are stout, rigid, and curved, of a dark yellowish-green colour, and $1\frac{3}{4}$ to $2\frac{1}{2}$ in. long. They are borne in bundles of five and are usually much clustered at the ends of the branches.

The cones are $1\frac{1}{2}$ to $3\frac{1}{2}$ in. long, much shorter than those of the limber pine.

The scales are very thick and of a purplish colour. The colour does not fade as readily as in the case of limber pine. The cone does not split and allow the seed to drop out, as does that of the limber pine, but remains closed and retains the seed for some years.

White-bark pine is an alpine species in Alberta and British Columbia, growing sparingly at altitudes of 3,000 to 7,000 feet. In the Rockies it extends as far north as the headwaters of the Parsnip river, and in the Coast mountains to the vicinity of Gardner canal.



Pinus resinosa Ait. **Red Pine**

Other common names: Norway pine*, yellow pine*, Canadian red pine (England).

French names: Pin rouge, pin resineux, pin de Norvège*.

The red pine is a tree 75 to 125 ft. high and 2 to 3 ft. in diameter. The trunk is erect and has very little taper, and, when growing in dense stands, is clear for over three-quarters of its length.

The bark, which is intensely reddish-brown in colour, separates into broad, irregular, flaky scales. In contrast with the darker bark of the white pine, with which it is frequently found growing, the trunk has a scraped or rubbed appearance. The bark is thick and resists fire fairly well.

The branches come out in distinct whorls and the crown is round and open. The twigs are red, and stouter than those of the white pine. The roots are wide-spreading, deep, and wind-firm.

The leaves are needle-like, 3 to 6 in. long, flexible, flat on one side and rounded on the other. They are borne two in a bundle and are distinguished

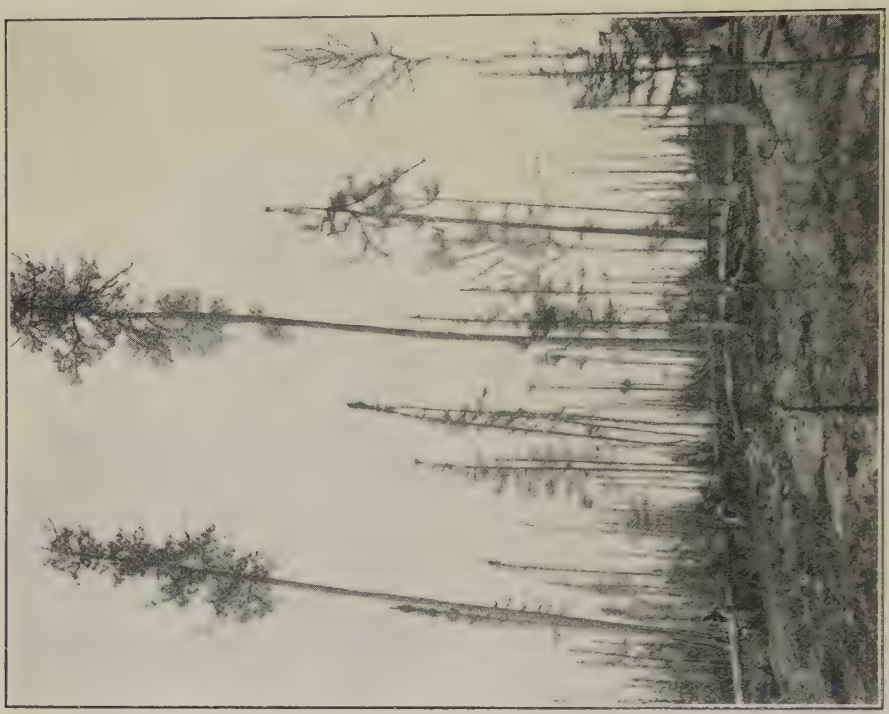


Photo. 10991. R. H. Campbell.
Jack pine (*Pinus Banksiana*)

Photo. 10992. R. H. Campbell.
Red pine (*Pinus resinosa*)

from those of the jack pine, the only other pine in Eastern Canada with two leaves in a bundle, by their greater length and the fact that they are not twisted. Seen at a distance the foliage appears to be growing in dark green tufts at the ends of the heavy branches.

The cones are 2 to 2½ in. long and more or less spherical when open. The scales are thickened at the top and have no prickle.

Red pine has practically the same distribution as white pine.

It is found from Nova Scotia to lake Winnipeg but reaches its best development in Ontario. It grows best on deep, loamy sand or gravel, and on such soil is often found in pure stands.

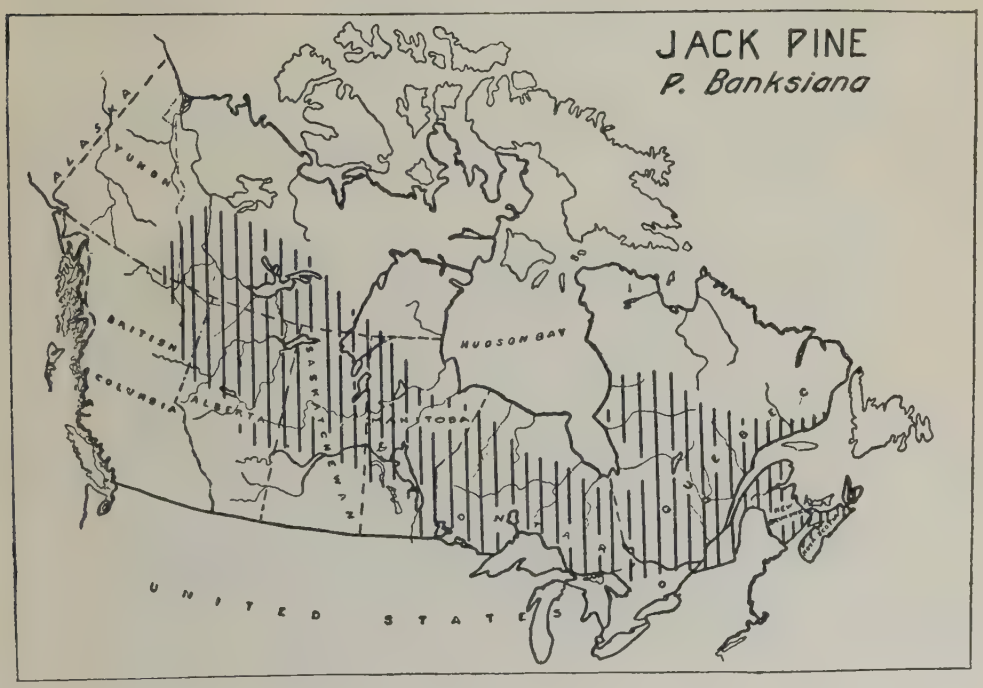
In colour the heartwood of the red pine is light red, the sapwood yellow or often almost white. The wood is generally darker and more resinous than that of the white pine. The softer grades, however, can scarcely be distinguished from it. The better grades of red pine serve for many uses to which the white pine is put. It is soft, light, tough, moderately strong, straight-grained, and easy to work. Being heavier and stronger than white pine it is more valuable for structural timbers. It has a deep sapwood readily penetrated by creosote and for this reason is used extensively for poles and piling.

Pinus Banksiana Lamb. **Jack Pine**

Other common names: Banksian pine, princess pine, grey pine, scrub pine*, cypress* (Quebec and Maritime Provinces), juniper* (Quebec).

French names: Pin gris, pin de Banks, pin chétif, cyprès*, pin des rochers.

The jack pine is found right across Canada from Nova Scotia to Alberta and the valley of the Mackenzie. It reaches its best development as a timber tree in northern Ontario, Manitoba, and Saskatchewan.



In the open or unfavourable sites the jack pine is small and scrubby, but when growing in pure dense stands on good sites it develops a straight, clear trunk and reaches a height of 60 ft. and a diameter of 24 in. It grows on very poor soils and is found growing in pure stands on dry, deep, coarse, sandy lands. It is also found growing on bare, rocky situations in scrubby, open stands. In northwestern Alberta the jack pine meets the lodgepole pine (*Pinus contorta* var. *latifolia*), a tree which it closely resembles and which is sometimes difficult to distinguish from it. For a comparison of these two species see Lodgepole Pine.

The bark of the jack pine, which is thin, has a reddish-brown colour, with a yellowish tinge in the top of the tree. The inner bark is slightly reddish near the base. It is roughened by narrow, rounded ridges, which separate into small, thick plates. The leaves are very short, $\frac{1}{2}$ in. to $1\frac{1}{2}$ in. long, twisted, and in bundles of two. In cross-section they are very flat and in colour are bright yellowish-green.

The cones are from 1 to 2 in. long and are usually found in pairs, one on each side of the twig, curved and pointed towards the tip of the branch. The scales are thickened at the tip but are without a prickle, except on young cones. The cones are persistent and remain on the branches many years.

The wood of the jack pine varies in colour from the creamy white of the sapwood to the brownish-yellow of the heartwood. In texture and weight it is also variable, some grades having the weight and hardness of red pine and others being comparatively light and soft. The better grades have much the appearance and working qualities of red pine. The tree, however, does not produce a large percentage of clear lumber, most of it being knotty. Its strength when air-seasoned is similar to that of red pine. It finds considerable use as railway ties, poles, pulpwood, construction lumber, boxes, etc.

Pinus rigida Mill. **Pitch Pine**

Other common names: Scrub pine*, jack pine*, rigid pine.
French name: Pin dur, pin à feuilles rigides.

Under the most favourable conditions the pitch pine will reach a height of 60 ft. and a diameter of 2 ft., but usually it is a low tree about 30 ft. high and 6 to 8 in. in diameter. The broad, open crown and the many crooked and persistent dead branches give the whole tree a very scraggy appearance. This is our only conifer that possess the power of sprouting from the stump.

The bark is reddish-brown in colour and coarse-scaled. On old trees it is thick and deeply furrowed with broad ridges which separate into loose scales.

The twigs, which are stout, remain rough for some time after the leaves drop. They are frequently found sprouting in clusters directly from the bark of the trunk. The roots penetrate deeply into the soil, where it is not too heavy.

The leaves are needle-like and in clusters of three. They are 2 to 5 in. long, stiff, and somewhat triangular in cross-section. This is the only pine in Eastern Canada with three leaves in a bundle.

The cones are $\frac{1}{2}$ to 3 in. long, spherical in shape when open, and without a stalk. The scales are thickened at the tip and have a stiff, curved prickle. The cones are very persistent and dead ones often remain sticking to the branch for five or six years.

The pitch pine has a very limited range in Canada. It extends from the Northeastern States barely across the international boundary into New Brunswick, Quebec, and Ontario. It enters the last-named province at the Thousand Islands, where it is found growing with the red pine among the rocks.

Photo. 5587. *B. R. Morton.*
Pitch pine (*Pinus rigida*): trunk and bark

As this pine is usually a scrubby growth in Canada, it is rarely suitable for any use but firewood.

Pinus ponderosa Dougl. **Ponderosa Pine**

Other common names: Western yellow pine, bull pine (British Columbia), yellow pine, British Columbia soft pine, jack pine*.
French name: Pin à bois lourd.

Under particularly favourable conditions the ponderosa pine reaches the majestic height of 160 to 170 feet, or more, and a diameter of 5 to 6 feet. Ordinarily it attains a height of 75 to 80 feet, and a diameter of 2 to 2½ feet. The trunk is straight, clear of branches, and has very little taper.

Photo. 6913. *D. R. Cameron.*
Ponderosa pine (*Pinus ponderosa*): trunk and bark

Photo. 182. *N. M. Ross.*

Lodgepole pine (*Pinus contorta* var. *latifolia*)

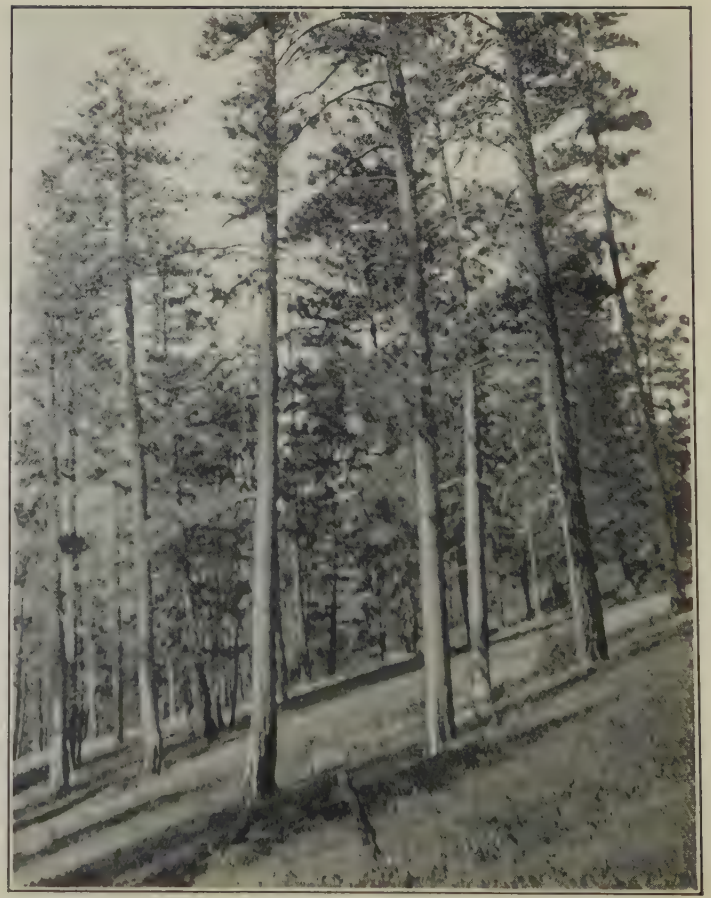
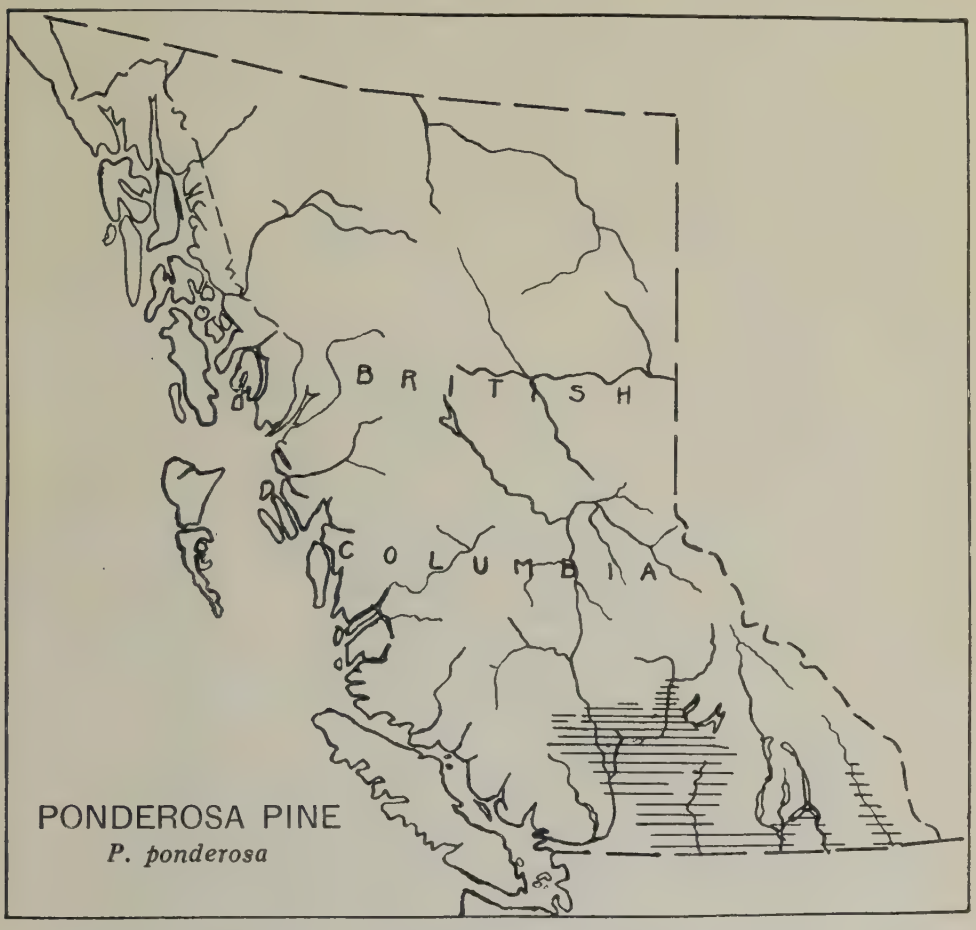


Photo. 6535. *F. B. Robertson.*

Ponderosa pine (*Pinus ponderosa*)

The bark on old trees is very thick, 3 to 4 inches, and is broken into plates 3 feet long. The surface of each plate is flat and scaly and of a reddish tinge, while the furrows are deep and dark grey in colour. The bark of young trees is dark and fissured into firm, scaly ridges. On account of its thick bark this tree, except when very young, is rarely damaged by ground fires.

The branches are short, stiff, much branched, and turned up towards the end, giving the tree a very characteristic appearance. Young twigs when broken have a smell similar to that of orange peel.



This pine is peculiar in having leaves in clusters of both three and two leaves. Three is the more common number to find. The leaves are very stout and stiff, and vary in length from 5 to 11 inches. They are dark green in colour and grow in heavy, brush-like clusters at the ends of the branches. This is the only pine with three leaves in a bundle native to western Canada.

The cones are $2\frac{1}{2}$ to $5\frac{1}{2}$ inches long, and $1\frac{1}{2}$ to 2 inches in diameter. Their colour, when ripe, is extremely variable and runs from grass-green to dark purple. The scales are tipped with a prickle. When the cone drops, a few of the scales at its base are often left sticking to the branch.

Ponderosa pine is confined to the drier portions of the southern interior of British Columbia, extending as far north as Vavenby on the North Thomp-

PINES (*Pinus*)

	WHITE (*P. Strobus*)	RED (*P. resinosa*)	PITCH (*P. rigida*)	JACK (*P. Banksiana*)	PONDEROSA (*P. ponderosa*)	LODGE-POLE (*P. contorta* var. *latifolia*)	WESTERN WHITE (*P. monticola*)	LIMBER (*P. flexilis*)	WHITE-BARK (*P. albicaulis*)
BARK	Any limb or trunk under 6 in in diameter is smooth and greenish-brown as a rule, later it becomes rough-ened.	Forms large flakes. Has a distinct reddish tinge.	Brownish-grey. Broken by very irregular furrows.	Reddish in colour. Thin. See lodgepole pine, a tree it closely resembles.	Very thick. Breaks into plates 3 ft. long on old trees. Furrows are deep and dark and strongly contrasted against the reddish scales.	Darker and thinner than that of the jack pine, a tree it much resembles.	Silvery-grey, thin and smooth. On old trees brown, and broken into blocks 1 in. thick.	Whitish-grey and smooth. On old trees brown and broken into blocks 2 in. thick.	Very thin, smooth and whitish. At base of old trees it will break into thin whitish scales.
TWIGS AND BRANCH-ES	Branches in more or less regular whorls of five and come out at right angles to the trunk.	Twigs stouter than those of white pine.	Young twigs frequently found springing from the side of the otherwise clear bole.		Short, stiff and turned up at the ends. Smell like orange peel when broken.		When growing in an open position it frequently possesses several long branches which extend out horizontally beyond the others.	Young branch-es are exceedingly limber Lower ones droop.	
LEAVES	5 in a bundle, the only pine native to Canada east of British Columbia with this number in a bundle. Triangular in cross-section. 3 to 5 in. long. See western white pine.	2 in a bundle. Three to five times as long, but not twisted, as are those of jack pine which is the only other pine in Eastern Canada with 2 leaves in a bundle. In cross-section flat on one side and round on the other. 5 to 6 in. long.	3 in a bundle, the only one native to Eastern Canada with this number. 3 to 5 in. long.	2 in a bundle, see lodgepole and red pines. Very short, twisted and flat. 1 to 2 in. long. Yellowish-green foliage.	2 to 3 in a bundle, the only pine native to western Canada with three leaves in a bundle. 5 to 11 in. long.	2 in a bundle and resembling those of the jack pine but darker and slightly less twisted. Also less scattered along twig and more bunched in plume-like clusters towards the tip of twig than those of the jack pine.	5 in a bundle. Stiffer and shorter than the white pine. Not so clustered at the ends of the twigs as with limber and white-barked pines.	5 in a bundle. Much clustered at the ends of the twigs. Usually shorter than western white pine.	5 in a bundle. Clustered at the ends of the twigs. Shorter than western white pine.
CONES	5 to 10 in. long. Scales thin and without prickle at the tip.	2 to 2½ in. long. Scales thickened at the tip and without prickle as a rule.	2 to 4 in. long. Scales thick and have a stiff curved prickle.	1 to 2 in. long. Scales thickened but have no prickle. Usually curved and in pairs pointing towards the end of the branch. They adhere to tree many years after maturing.	2½ to 5¼ in. long. Green to purple in colour before ripening. When they fall a portion is frequently left on the tree.	¾ to 2 in. long. In pairs and persistent like those of the jack pine but usually less curved. Scales thickened and prickle-tipped.	6 to 10 in. long. Like those of the white pine of the East but much longer.	4 to 10 in. long. Tips of the scales very much thickened. Yellowish-brown colour which fades. Cones open and seed escapes at maturity.	1½ to 3½ in. long. Scales very much thickened. Dark purple colour which persists. Cones and seed remain on the tree for years.

son river. It does not occur on the western slope of the Coast range. It grows on dry well-drained slopes or plateaux, usually between 1,500 and 2,500 feet elevation, but on exposed southerly slopes, it may extend to 3,500 feet.

The wood of the ponderosa pine is light, soft, strong in proportion to its weight, and works very easily and smoothly, without splintering or splitting. It offers a fine smooth surface and a very attractive grain. It takes and retains paints, stains, and varnishes well. It seasons well, being free from warping and checking. Once seasoned, it holds its shape without shrinking or swelling.

The wood varies in colour and texture according to the part of the log from which it is cut. The outer wood is yellowish-white, with a fine grain and satiny texture. The inner wood is somewhat more reddish in colour and somewhat harder and coarser in grain.

It makes a suitable lumber for outside use, especially for siding and sash and doors. Considerable quantities are cut into the ordinary dimension material used in building construction, such as rafters, joists, studding, etc. It has very much the same texture and other qualities as white pine and is used extensively for interior trim, foundry patterns, turnery, kitchen furniture, agricultural implements, cooperage, and boxes.

Pinus contorta Dougl. **Shore Pine**

Other common name: Scrub pine.

Pinus contorta Dougl. var. **latifolia** Engelm. **Lodgepole Pine**

Other common names: Black pine, Western jack pine, white pine (Alberta), cypress* (Southern Alberta and Saskatchewan).

French name: Pin de Murray.

This species first became known to science through specimens sent to Europe by David Douglas about 1825-6-7; these he had taken from swampy ground near the sea-coast, where the tree develops a scrubby form. To this type was given the name *Pinus contorta*. For a considerable time many botanists maintained that this coast form and the inland form (lodgepole pine) were distinct species, and to the latter was given the name *Pinus Murrayana*. Subsequent research, however, has led botanists to the belief that the two forms should be included under the same species.

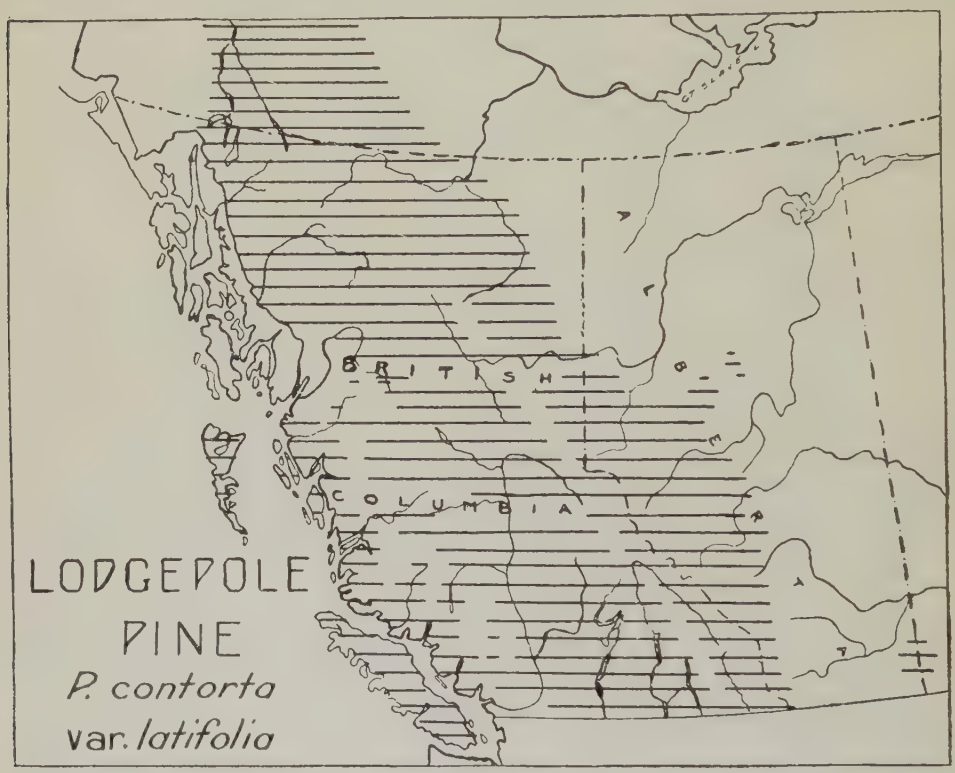
Lodgepole pine has a very wide range, extending over most of British Columbia and into the Yukon territory on the north and the eastern slope of the Rocky mountains, Lesser Slave lake, and Cypress hills in Alberta on the east. It is extremely variable in its characteristics. Though not a timber-line species, it grows at altitudes from sea-level to 5,000 or 6,000 feet. In the western part of its range, near the Pacific coast, the tree is ordinarily 20 to 40 ft. high and 6 to 20 in. in diameter, while farther east it is 50 to 100 ft. high and has a diameter of 12 to 24 in. The eastern variety, usually growing in dense stands, develops a tall, clean, slender trunk. The coast trees are shorter and have branches extending all the way down the stem. The thickness of the bark is another variable feature. Throughout its western range it is 1 in. thick, reddish-brown, and deeply furrowed. In Alberta and throughout the eastern part of its range the bark is thinner, greyish-brown in colour, and comparatively smooth.

Its leaves, which are borne two in a bundle, are $\frac{1}{2}$ to 1 in. long on the coast, and 2 to 3 in. long in its eastern range. The leaves on the eastern trees are thicker than those of the coast.

The cones are of a shiny-brown colour and the scales are tipped with a prickle. On the coast they are $\frac{3}{4}$ to $1\frac{1}{4}$ in. long and farther east 1 to 2 in. long.

Like those of the jack pine (*Pinus Banksiana*), open or closed, they adhere to the branches for a great many years after maturing. Like the jack pine, the lodgepole pine produces cones at the early age of 7 to 10 years.

In northwestern Alberta, in the region about Lesser Slave lake, this species meets the jack pine (*Pinus Banksiana*), which it closely resembles, and these two trees are sometimes difficult to distinguish. The bark of the lodgepole pine, however, is as a rule thinner, darker, and broken into finer scales than that of the jack pine. The foliage, too, is darker than that of the jack pine, and the leaves have the appearance of being more bunched towards the ends of the twigs in plume-like clusters. The leaves of the jack pine are more scattered along the twigs and slightly more twisted. The cones of the lodgepole pine are, as a



rule, a little more slender than those of the jack pine. They are also more roughened by knobs and have a prickle at the tip of the scale, which is ordinarily absent in the mature jack pine cone. The cones on both trees are curved; those of the jack pine slightly more so than those of the lodgepole pine.

The wood of lodgepole pine is coarse, fairly soft, stiff, and normally straight-grained. The heartwood is yellow or yellowish-brown in colour and the sapwood paler, sometimes almost white. In strength it is practically equal to Western yellow pine and exceeds Engelmann spruce and alpine fir. It produces stronger poles than red cedar but these are not so durable in contact with the soil.

Lodgepole pine is chiefly used for railway ties, mine-props, and poles. It has not in the past been used to a great extent in the manufacture of lumber,

for the reason that there has been sufficient timber of larger species available. It is a useful wood for light construction and finish, especially where the surface is to be painted, and it is an important box material, for which the fruit industry of British Columbia provides an increasing local market. It is a valuable species for the manufacture of pulp.

THE LARCHES

Nine species of larch (*Larix*) are known, most of them confined to the northern parts of the Old and New Worlds. Three species occur in Canada, two of which are confined to the West. The only species found in the East also extends into the West, and, along with the black and the white spruces, forms the northern limit of tree growth in this country.

The larches as a whole are tall trees, with straight, gradually tapering stems. The wood is of high technical value and used for the same purposes as that of the hard pines.

They can be readily distinguished from other cone-bearing trees on account of their leaves being borne in brush-like clusters of from twelve to forty at the end of short spur-like growths, or knobs, which stand out from the twigs. The leaves of the pines are also borne in clusters, but are always done up in separate bundles of from two to five. The leaves of the larches drop off each year, so the tree is left bare during the winter. No other native cone-bearing species does this.

Larix laricina (Du Roi) Koch **Tamarack**

Other common names: Larch, hackmatack (Maritime Provinces), American larch, juniper* (Maritime Provinces), black larch.

French names: Mélèze, tamarack, mélèze d'Amérique, épinette rouge*.

The tamarack is a tree 60 to 70 ft. high and 1 to 2 ft. in diameter. The trunk is straight and cylindrical. On young trees or those growing in dense stands the crown is narrow, but as the tree becomes older the crown opens up and becomes irregular. With slight crowding the trunk clears itself quickly of branches.

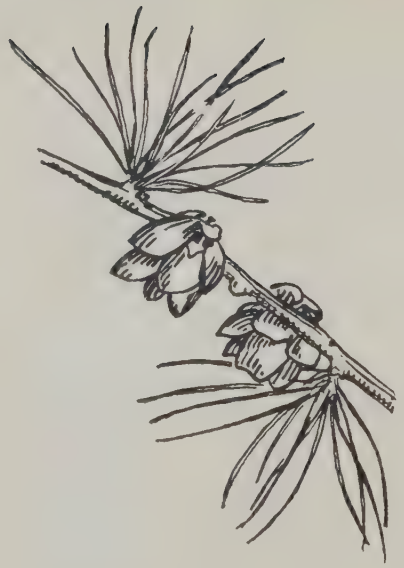
The bark is roughened by small, roundish, flat scales of reddish colour which flake off abundantly.

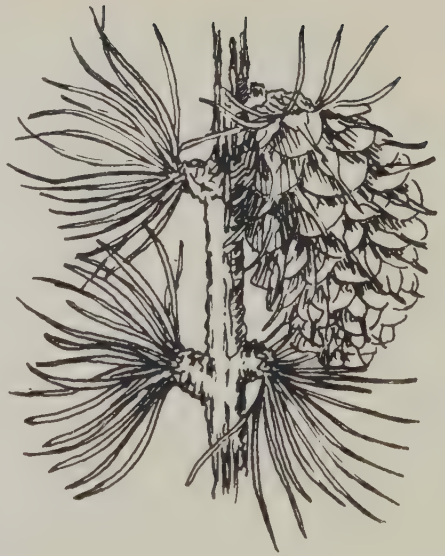
The twigs are slender and pliable and in winter are covered with knobby buds. They are from yellowish to reddish-brown in colour.

The leaves, needle-like and $\frac{3}{4}$ to $1\frac{1}{4}$ in. long, are somewhat triangular in cross-section and grow in clusters of from twelve to twenty on short, spur-like growths, or knobs, on the twig. They drop off every autumn and leave the tree bare in winter, as is the case with all the larches.

The cones are small, rarely more than $\frac{1}{2}$ in. long, stalked, and composed of about twenty chestnut-brown scales.

This tree is found from Labrador to the Rocky mountains and north to the mouth of the Mackenzie river, where, along with the black spruce, it is found at the northern limit of tree growth. In the southern part of its range it is confined chiefly to bogs and swamps and there associates with black ash and balsam fir. In the north it is found in better-drained situations, such as slopes of rivers and streams.



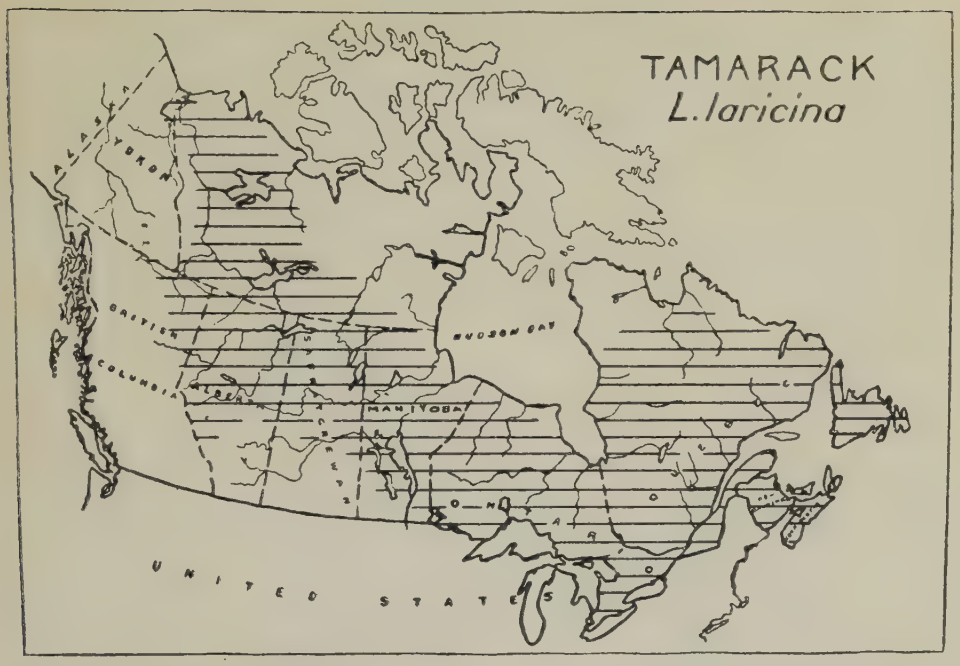


LARCH CONES AND LEAVES

1 Tamarack (*Larix laricina*)

2 Western larch (*Larix occidentalis*)

3 Alpine larch (*Larix Lyallii*)



Tamarack is among the heaviest and strongest of the softwoods of eastern Canada. It is quite durable and for that reason is used for railway ties, posts, and telegraph poles. The wood is valuable for construction purposes, pumps, tanks, and vehicle supplies.

Larix occidentalis Nutt. **Western Larch**

Other common names: Larch, Western tamarack, tamarack.
French name: Mélèze occidental.

The western larch is a large and symmetrical tree 100 to 180 ft. high and 3 to 4 ft. in diameter. The trunk is very long and clear, and the crown is very small and narrow when the trees are growing in crowded stands.

The bark on old trees is very thick and is a splendid protection against fire. It is deeply furrowed to form large ridges and is reddish-brown in colour. On young trees it is thin, scaly, and greyish-brown.

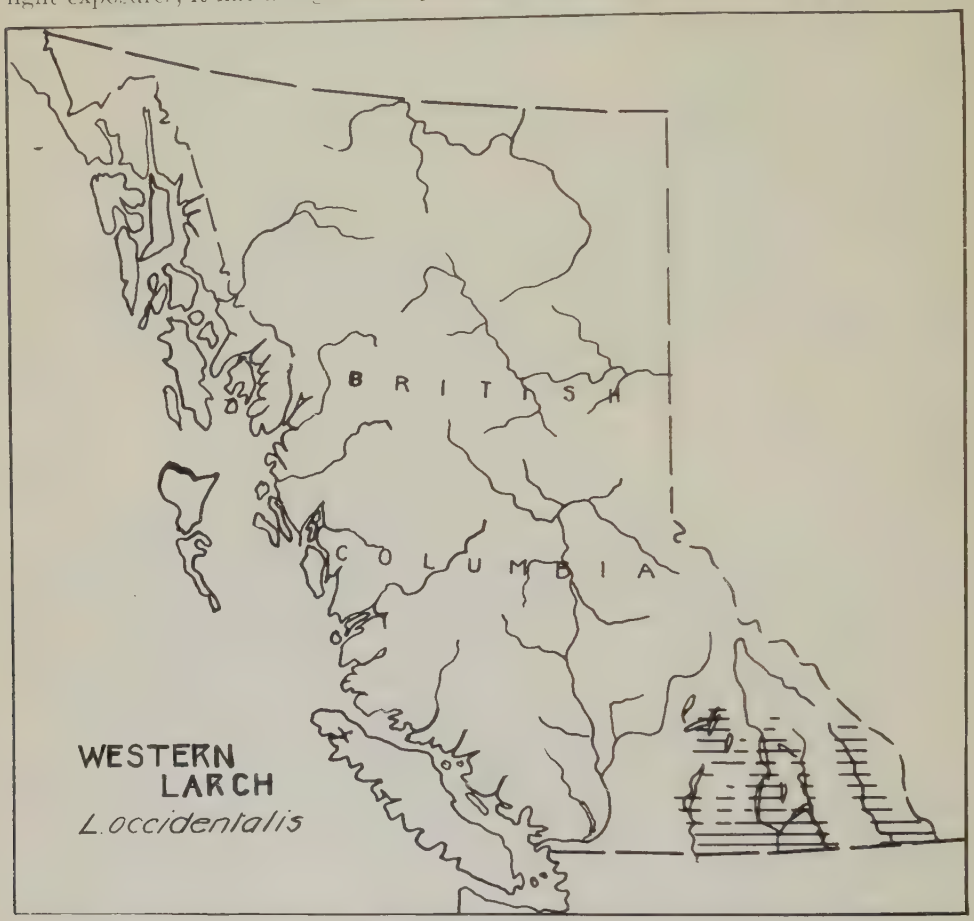
The leaves are 1 to 2 in. long, triangular in cross-section, and pale yellowish-green in colour. They grow in clusters of fourteen to thirty at the ends of little spurs along the twigs. They all drop off in the autumn as do those of the other larches.

The twigs are brittle and somewhat downy.

The cones are 1 to 1½ in. long, stalked, and the scales are densely coated with down. The pointed bracts, which are attached to the underside of the scale, project beyond the margin and are bent slightly backwards.

Western larch is confined to the southeastern part of British Columbia, where it is generally found on upper benches at altitudes between 1,800 and 4,000 feet, occupying an important place in the intermediate type between the dry yellow pine and Douglas fir type and the Engelmann spruce type of the higher altitudes. It seldom occurs in pure stands, but is usually mixed with Douglas fir, lodgepole pine, Engelmann spruce, alpine fir, and Western hemlock.

The wood is hard, straight- and fine-grained, very heavy, and of a quality very similar to Douglas fir. The heartwood is of a dark reddish-brown colour and often has very much the same appearance as Douglas fir. Ordinarily, however, Western larch is darker, and, viewed from certain directions with certain light exposures, it has a slight silvery sheen. In colour, the sapwood is yellowish-



brown, much lighter than the heartwood. The wood is valued for all structural purposes where strength is required and its strength, hardness, and durability make it useful for timbers, ties, and piling. In lumber it makes attractive flooring, interior trim, and panelling.

Larix Lyallii Parl. **Alpine Larch**

Other common names: Mountain larch, Lyall's larch.
French name: Mélèze de Lyall.

The alpine larch is 30 to 40 ft. high and 1 to 2 ft. in diameter. The trunk tapers very much from the base to the top and is very branchy, and in general the tree has a stunted appearance. The branches, which extend widely and usually turn up at the end, form a very irregular crown. They are tough and not brittle as are those of the Western larch. New shoots are covered with a fine white down.

The bark is thin, even in old trees, reddish-brown, and furrowed into flat ridges of loose scales.

The leaves, which drop off in the autumn and leave the tree bare, are needle-like, 1 to 1½ in. long, and more or less four-sided in cross-section, and are borne in clusters of thirty or more on a spur-like growth. A cross-section of a leaf shows two resin ducts, one in each of the two angles; that of the Western larch shows only one duct.

The cones are 1½ to 2 in. long, somewhat larger than those of the Western larch, and are reddish-purple in colour. The scales have a fringe of white hair on their margin. The pointed bract attached to the underside of the scales

LARCHES (*Larix*)

	TAMARACK (*L. laricina*)	ALPINE LARCH (*L. Lyallii*)	WESTERN LARCH (*L. occidentalis*)
BARK	Thin.	Thin, rarely over 1 in. even on old trees.	Thicker than that of the other two larches. Furrowed into large ridges.
TWIGS	Twigs slender and pliable.	Branches hang down conspicuously and turn up at ends. Twigs very tough.	Crown composed of a very few horizontal branches. Twigs are brittle.
LEAVES	¾ to 1¼ in. long. 3-sided in cross-section. Cross-section shows two resin ducts near outside edge.	1 to 1½ in. long. 4-sided in cross-section. Cross-section shows one resin duct in each of 2 corners.	1 to 2 in. long. 3-sided in cross-section. Cross-section shows no resin ducts.
CONES	Spherical, rarely more than ½ in. long. No bracts visible.	Cones 1½ to 2 in. long. Pointed bracts project beyond the scale and bend back.	From 1 to 1½ in. long. Pointed bracts project beyond the scales but as a rule not bent as much as those of the alpine larch.

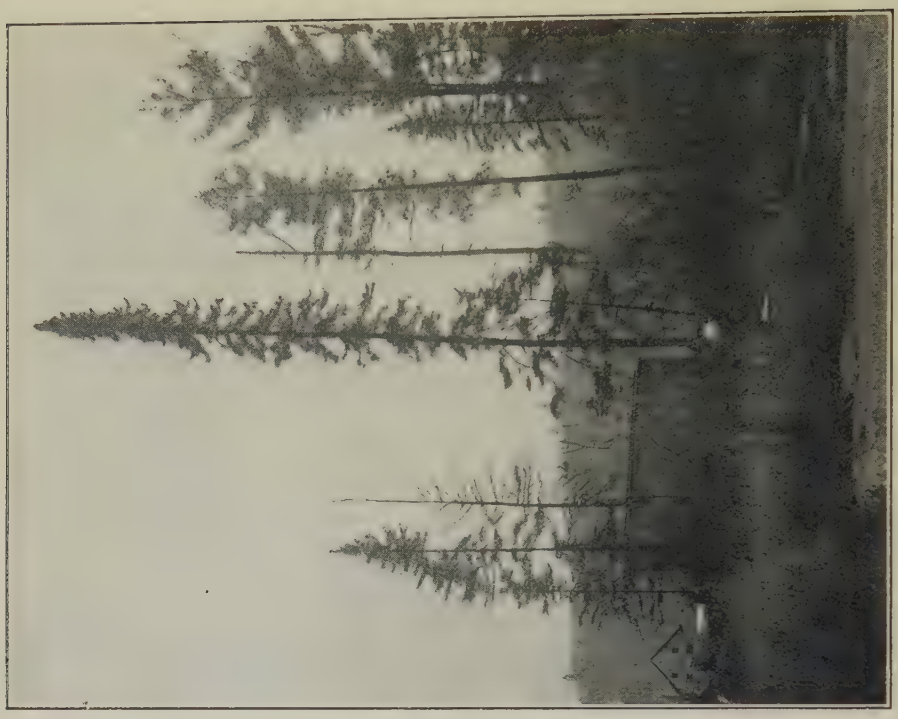


Photo. 10987. *R. H. Campbell.*

Black spruce (*Picea mariana*)

Photo. 11012. *R. H. Campbell.*

White spruce (*Picea glauca*)

projects out much beyond them and is then bent back. These bracts are not seen in the tamarack, and in the Western larch they are, as a rule, only slightly bent.

The alpine larch is strictly a tree of the mountains and forms the upper timberline in British Columbia and Alberta. Usually it is found at an elevation of 6,500 to 7,000 ft. on open, grassy slopes associated with the limber and white-bark pines.

The wood is used locally only.

THE SPRUCES

The spruces (*Picea*) are widely spread throughout the northern hemisphere. Eighteen species are recognized, of which seven occur in North America and five in Canada. Two of the native spruces are confined to the West and one to the East. The other two species are to be found from the Atlantic westward and northward to the mouth of the Mackenzie river on the Arctic ocean.

The spruces can be readily distinguished from all other evergreens by their leaves, which are sharp-pointed and, with two exceptions, four-sided in cross-section. They are single and stemless, and each is borne on a tiny projection on the bark of the twig. In arrangement they are not distinctly two-ranked, as is the rule with the hemlocks and firs, but either bristle out from all sides or, on horizontal branches, are twisted and crowded densely towards the upper side of the twig.

The Norway spruce (*Picea Abies*), a native of Europe, is extensively planted on this continent for ornamental purposes. It can be readily distinguished from native spruces by its twigs and small branches, which have a decided tendency to droop, and by its cones, which are considerably longer (4 to 5 in.).

The wood of the different spruces is very similar. Spruce timber of light weight resembles that of soft pines. Its light colour, its freedom from resin, and the desirable characters of its fibres make spruce the premier pulpwood of the world. The tasteless character of spruce wood makes it of value for food containers. It is very widely used in construction, interior finish, boxes and crating, and many specialty purposes.

Picea mariana (Mill.) B. S. P. **Black Spruce**

Other common names: Red spruce*, double spruce, water spruce, swamp spruce.

French names: Épinette (Épicéa) noire, épinette jaune, épinette bâtarde, épinette rouge*, sapinette noire (France), sapin noir.

The height of the black spruce is about 35 to 40 ft. and the diameter from 6 to 9 in., although on better-drained soils it may reach much larger size. At the extreme north of its range it is dwarfed to a mere shrub.

Young trees have a beautiful, regular, and symmetrical outline, but on old trees the slender, drooping branches, with upturned ends, form a narrow, open, irregular, and unsightly crown.

The bark is thin, greyish-brown, and scaly. The inner bark has a reddish tinge. The end twigs are slightly coated with rusty-coloured hair.

The leaves are $\frac{1}{4}$ to $\frac{3}{4}$ in. long and without stalks. They are blunt-pointed and four-angled in cross-section. Their colour is bluish-green.

The cones are $\frac{1}{2}$ to $1\frac{1}{2}$ in. long, and spherical in shape when open. The scales are stiff and will break if crushed. The scales are toothed on the margin,

while those of the white spruce and red spruce are not toothed. The stem of the cones is slightly curved, and the cones are bent forward. Cones are not confined to the upper portion of the tree, as with the red and white spruces. They remain on the trees several years after the seed has been shed.

This tree ranges right across the continent from Labrador and the Maritime Provinces to northern British Columbia and the Yukon Territory and north to the mouth of the Mackenzie river. It is one of the most northerly growing trees. In the East it is confined for the most part to swamps and undrained places. In the North it is found in well-drained valleys and on stony slopes. It reaches its best development in Saskatchewan and Manitoba. It is associated chiefly with tamarack and aspen.

Black spruce is especially valuable for pulpwood, for which purpose it is generally used. It is one of the most important pulpwood species in Canada. Owing to the comparatively small size attained by this tree, its wood is not used for saw-timber to the same extent as either the white spruce or the red spruce. As a rule it has narrower growth-rings than the other spruces and produces wood that is slightly heavier, stronger, and more durable, and on this account is preferred to the other species for mining timbers, ties, and cooperage.

Picea glauca Voss **White Spruce**

Other common names: Single spruce, skunk spruce, northern spruce (Labrador), pine* (Hudson Bay), cat spruce (Nova Scotia).

French names: Épinette (Épicéa) blanche, épinette grise, épinette à bière, sapinette blanche (France), sapin blanc.

In favourable situations the white spruce reaches a height of 100 ft. and a diameter of 4 ft. The average height is much less, however, being about 50 ft., with a diameter of 1½ to 2 ft.

The trunk is often branchy, and the crown is deep except in very dense stands. The crown is also very symmetrical and narrow, and at a distance has a very spire-like appearance. It is very shallow-rooted.

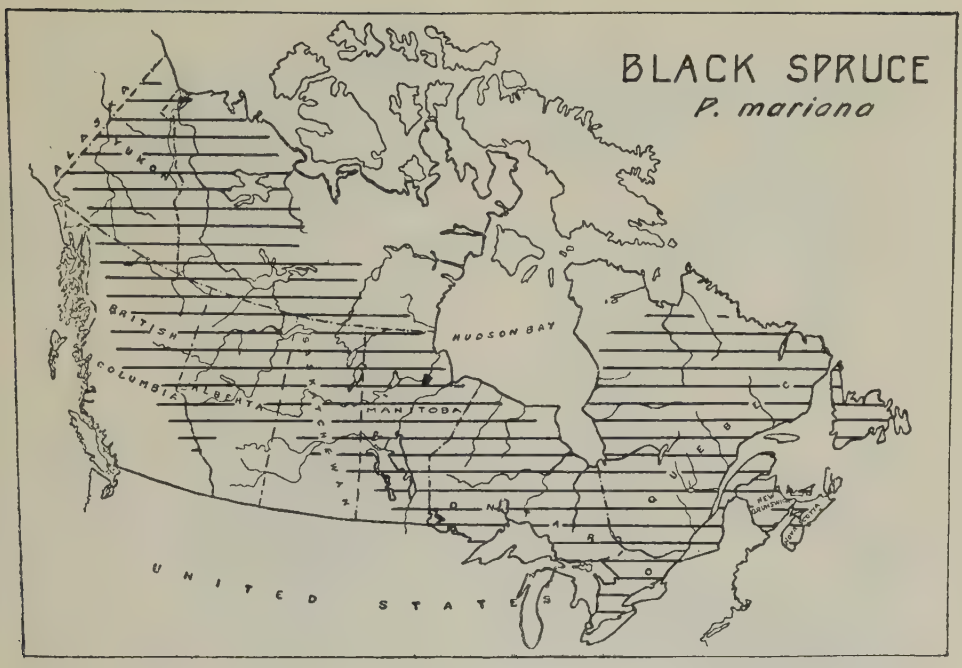
The bark is thin and smooth, becoming flaky, with small ashy-brown scales. On account of its thin bark it is very susceptible to fire-damage.

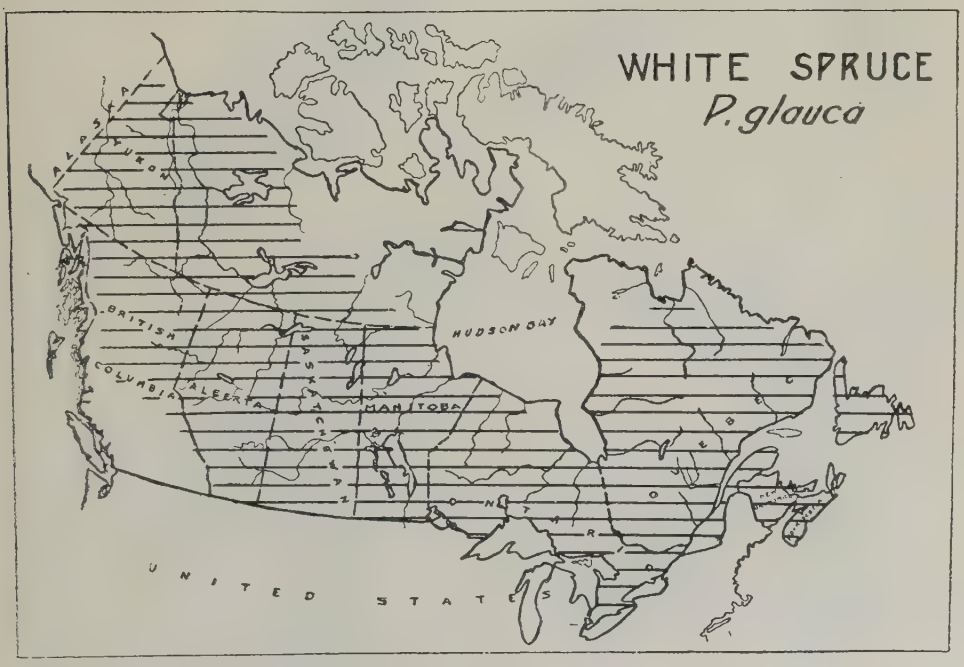
The leaves are ½ to ¾ in. long and four-sided in cross-section. They are sharp-pointed, pale blue-green in colour, and give out a very characteristic skunk-like, pungent odour when crushed. They come out from all sides of the twig, but are twisted and crowded to the upper side. As with all spruces, the leaves are without stalks, but are borne on little spur-like projections of the twig.

The cones are 1½ to 2 in. long. The scales are narrow in proportion to their length and very flexible and elastic. If a cone is crushed in the hand it will regain its shape when released, and not break, as with the black spruce. The cone scales are smooth on the margin and not ragged as those of the black spruce. The cones do not remain long on the tree after the seed has fallen out of them, but drop off before the new crop of cones is produced.

The white spruce extends across Canada from Labrador to northern British Columbia and the Yukon territory and north practically to the limit of tree growth.

It grows best on well-drained, moist, gravelly soil, but is not very exacting, for it is found on rocky slopes and borders of lakes and streams. It frequently occurs in pure stands, but is often mixed with red and black spruce, tamarack, birch, and aspen, and, in the foot-hills of Alberta, with Engelmann spruce.


BLACK SPRUCE
P. mariana
HUDSON BAY
BRITISH COLUMBIA
ALBERTA
MANITOBA
ONTARIO
UNITED STATES


WHITE SPRUCE
P. glauca
HUDSON BAY
BRITISH COLUMBIA
ALBERTA
MANITOBA
ONTARIO
UNITED STATES

SPRUCE LEAVES AND TWIGS

1 Red spruce (*Picea rubra*). 2 Black spruce (*Picea mariana*). 3 White spruce (*Picea glauca*) 4 Engelmann spruce (*Picea Engelmanni*). 5 Sitka spruce (*Picea sitchensis*).

White spruce is the most important commercial tree in Canada, since it occupies first place in pulp production and second place as a lumber species. It is considered the most important pulpwood obtainable in North America on account of the quantities available, its long, tough, colourless fibre, and its comparative freedom from resin. The wood is used extensively for general construction and carpentry, boxes, cooperage, mine props, masts, and spars.

P. glauca Voss var. **albertiana** Sarg. **Western White Spruce**

This is a tree that reaches the height of 150 feet and the diameter of 3 to 4 feet. It has shorter and broader cones than the typical white spruce of the East. It is found at low altitudes throughout the Rocky mountains in Alberta and British Columbia.

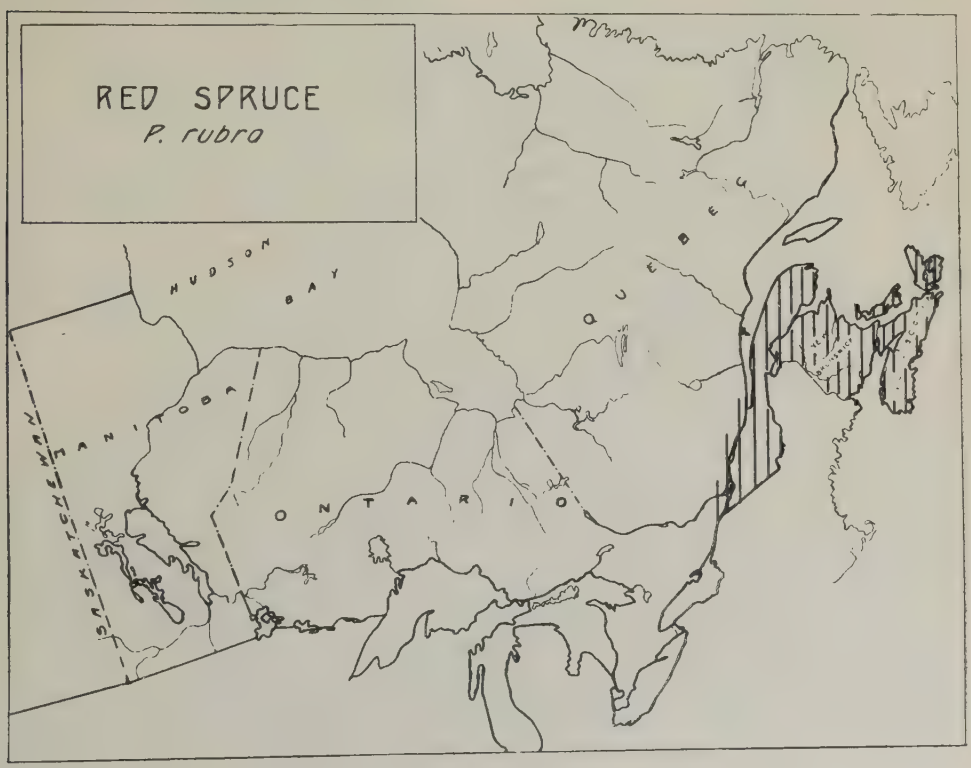
Picea rubra Link. **Red Spruce**

Other common name: Yellow spruce.

French name: Épinette (Épicéa) rouge.

The red spruce is a tree 50 to 75 ft. high and 1 to 2 ft. in diameter. The trunk is very straight but, unless grown in a dense stand, very branchy. The crown is conical and narrow. The branches extend out at right angles to the trunk, the lower ones drooping slightly. The new twigs are reddish-brown and slightly hairy. The root-system is shallow and spreading, and the tree is, therefore, frequently overthrown by winds.

The bark is extremely thin and easily damaged by fire. It is reddish-brown in colour, covered with tight scales of irregular shape.

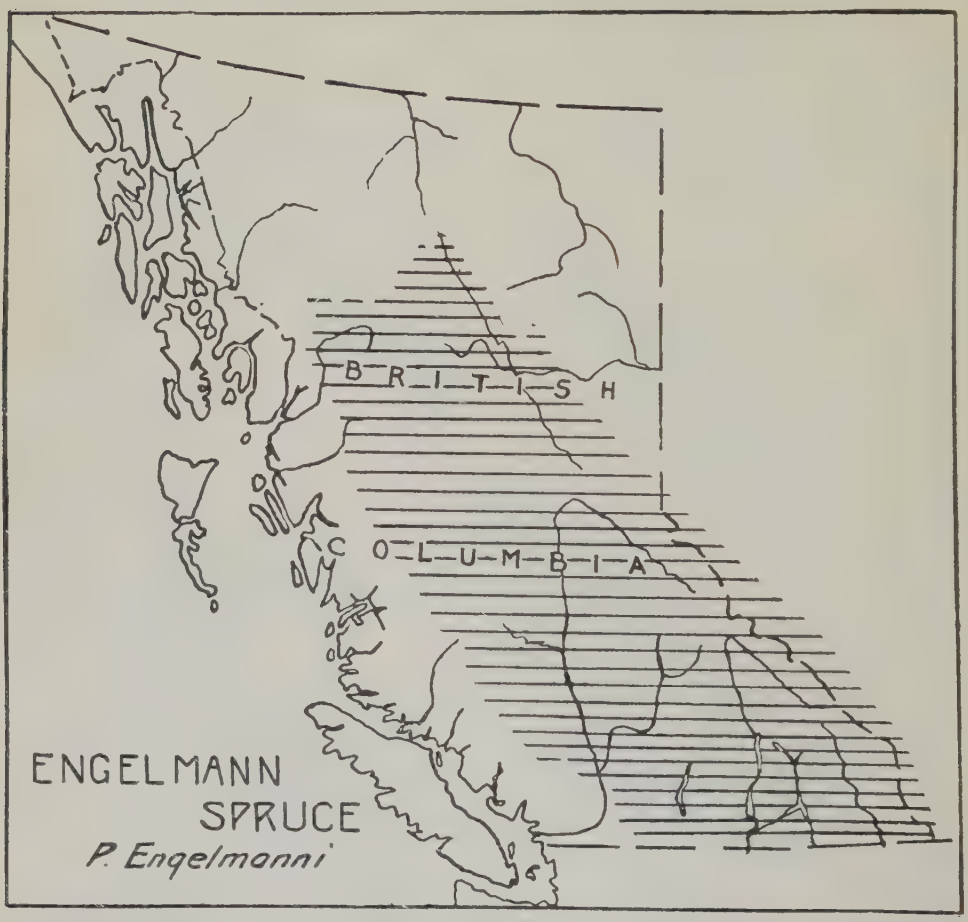


The leaves are ½ in. long, four-sided and pointed. They are straight or curved and, as in all spruces, are without stalks. Their colour is yellowish-green.

The cones are 1½ to 2 in. long, oval, and oblong. They are stiff and very harsh to the touch when dry. They do not remain hanging on the tree as do those of the black spruce, but drop off during the first winter.

The range of this tree in Canada is not wide. It is confined to Nova Scotia, New Brunswick, and the eastern part of Quebec. It grows on a variety of soils but develops best in well-drained, moist valleys. It forms pure stands but is often found mixed with balsam fir, hemlock, white birch, yellow birch, and sugar maple.

The wood is slightly heavier and stronger than white spruce, but is not usually separated from the other species when sawed into lumber. It is a valuable pulpwood and is used as lumber in much the same way as white and black spruce.



Picea Engelmanni Engelm. **Engelmann Spruce**

Other common names: Mountain spruce, Rocky Mountain spruce, Western white spruce.*

French name: Épinette (Épicéa) d'Engelmann.

The average diameter of mature Engelmann spruce trees is from 1½ to 3 feet, and the height from 80 to 120 feet, but trees on favourable sites will attain 6 feet in diameter and 180 feet in height.

The crown is symmetrical, narrow, and spire-like and, except in very dense stands, extends nearly to the ground. The lower branches are often drooping. The roots are shallow and wide-spreading and, therefore, the tree is very subject to windfall. The bark is thin, brown, and scaly.

The leaves are about 1 in. long and have short, flat points. They are crowded and curved to the upper side of the twig, but are flexible and soft to the touch. When crushed they have a disagreeable odour. The colour is more or less blue. Branchlets are minutely hairy.

The cones are 1 to 3 in. long, green at maturity but later turning brown. The ends of the scales are squarish, but sometimes pointed and notched.

Engelmann spruce occurs throughout the interior mountain region of British Columbia and on the eastern slope of the Rocky mountains in Alberta. It does not occur west of the summit of the Coast range nor, as far as is known, north of the drainage of the Peace and Nass rivers. It grows in pure or mixed stands at altitudes of from 3,000 to 5,000 feet in southern British Columbia and in the north at from 1,000 to 4,000 feet. It is the most important of the forest species in the interior of British Columbia.

The wood of this tree, usually sold as mountain spruce, competes with that of white spruce (*Picea glauca*) in the Prairie Provinces. Engelmann spruce is usually obtainable in greater dimensions free from defect than is white spruce, and for this reason is better adapted for specialty uses such as aeroplane parts, oars, paddles, etc., where long lengths free from defect are required. Tests of Engelmann spruce by the Forest Products Laboratories of Canada indicate that it is slightly heavier than white spruce and should, therefore, be as good as, or even better than, white spruce for pulp.

Picea sitchensis (Bong.) Carr. **Sitka Spruce**

Other common names: Menzies spruce, tideland spruce, coast spruce.

French name: Épinette (Épicéa) de Sitka.

Sitka spruce is the largest and most imposing of all the spruces. Mature trees are usually from 3 to 6 feet in diameter and 125 to 175 feet high, but are frequently found 8 to 12 feet in diameter and up to 250 feet in height. In dense stands this tree produces a long clear trunk. Old-growth stands will furnish often 200,000 to 300,000 feet board measure per acre.

The branches are horizontal, frequently with many slender, hanging side branchlets.

The bark is reddish-brown and extremely thin. It peels off in large, thin, flat scales.

The leaves are stiff, thick, sharp-pointed, and four-angled in cross-section. They bristle out all around the twig. New twigs are smooth and yellowish-brown.

SPRUCES (*Picea*)

	WHITE (*P. glauca*)	RED (*P. rubra*)	BLACK (*P. mariana*)	ENGELMANN (*P. Engelmanni*)	SITKA (*P. sitchensis*)
BARK	Greyish-brown and thin. Less scaly than that of either the red or black.	Remarkably thin.	Inner bark has a reddish tinge.	Thin.	Very thin. Large trees often have a swollen base.
TWIGS and BRANCHES	Twigs smooth with yellowish-brown leaf-scars. Branching on the whole more regular than in either the red or black spruce.	Twigs slightly hairy and tan-red in colour. Branches as a rule extend out well at right angles.	Twigs slightly hairy and darker in colour than white spruce. Brown and duller in colour than those of red spruce.	Branchlets slightly hairy. Lower branches often drooping.	New twigs smooth and yellowish. Many slender hanging side branchlets.
LEAVES	Sharp-pointed, blue-green and not shiny. Longer and more slender than those of either the black or red spruce. Crowded towards the upper side of the twigs. Strong odour when crushed.	Blunter-pointed than white spruce, yellowish-green and very glossy. About the same size as those of the black but a little stouter.	Blunter than those of the white spruce, blue-green and not shiny.	Long for a spruce, point short and flattened. Crowded and curved to the upper side but soft to the touch. Strong odour when crushed. Bluish colour.	Stiff and thick, point sharp. Bristle out all around the twig.
CONES	½ to 2 in. long. Scales comparatively soft and flexible. Scales narrow in proportion to their length. Margins smooth. Borne on short stems and usually fall the first year.	1 to 2 in. long. Margin of the scales usually smooth, sometimes slightly notched or wavy. The cones are confined for the most part to the top of the tree and usually fall the first year. They are stalked and harsh to the touch.	½ to 1 in. long. Margin of the scales ragged. Scales stiff and will break if cone is pressed when dry. Not confined to the top of the tree. Remain for many years before dropping.	1 to 3 in. long. Scales thin and papery, ends squarish but often pointed and notched.	2 to 4 in. long. Scales thin and papery but ends not so square as those of the Engelmann. Hang down conspicuously from the branches.

SPRUCE CONES

1 White spruce (*Picea glauca*). 2 Black spruce (*Picea mariana*). 3 Red spruce (*Picea rubra*). 4 Engelmann spruce (*Picea Engelmanni*). 5 Sitka spruce (*Picea sitchensis*).

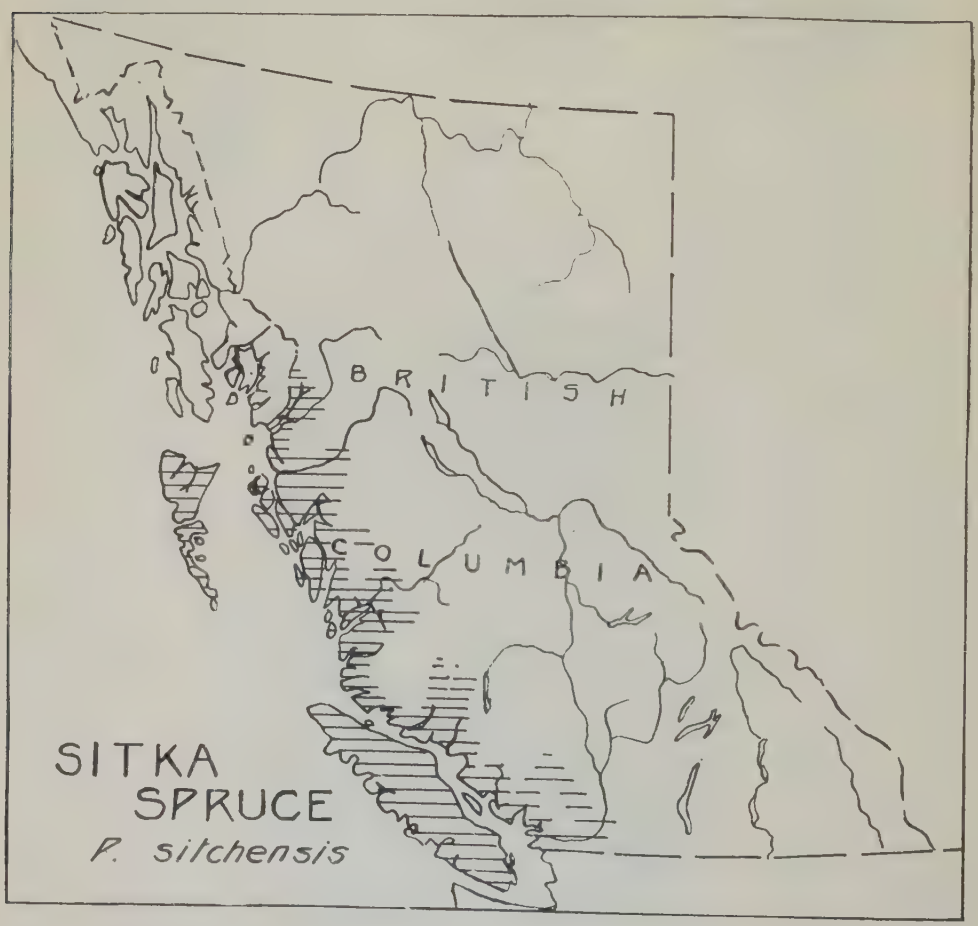
Photo. 2775. H. C. Wallin.

Sitka spruce (*Picea sitchensis*): trunk and bark

The cones are 2½ to 4 in. long, oval, and short-stalked, and hang downwards. Their colour varies from green to dark red when mature. The scales are thin and papery.

Sitka spruce is confined to the coastal region in British Columbia, and seldom extends more than 50 miles from the salt water, or to an altitude exceeding 1,000 feet. Farther south in the United States it is reported as growing at 5,000 feet altitude. It is more abundant in the northern portion of the coast, especially on the Queen Charlotte islands.

Sitka spruce lumber may be obtained in greater dimensions clear of defects than that of the other spruces, a fact which gives it great technological value. This character, in combination with its light weight and comparative strength, renders it especially desirable in aeroplane construction. It has uses similar to those of the other spruces, and its great size makes it useful in furnishing large structural timbers, and masts and spars for vessels of all sizes. It is a valuable wood for pulp and paper.



HEMLOCK CONES
1 Eastern Hemlock (*Tsuga canadensis*). 2 Western Hemlock (*Tsuga heterophylla*). 3. Mountain hemlock (*Tsuga Mertensiana*).

THE HEMLOCKS

Seven species of hemlock (*Tsuga*) are known. Four are found in North America; of these three occur in Canada. Two of the native species are found in British Columbia and one in the eastern provinces. The other species are found in eastern Asia and Japan, where they are used considerably for decorative planting.

The hemlocks can be readily recognized from other evergreens by their leaves. These leaves resemble those of the firs (*Abies*) in their two-ranked, or feather-like, arrangement on the twig, but differ from them in that each leaf has a distinct, tiny, thread-like stem which is attached to a small projection on the bark of the twig. The species can be distinguished from each other by their leaves and cones.

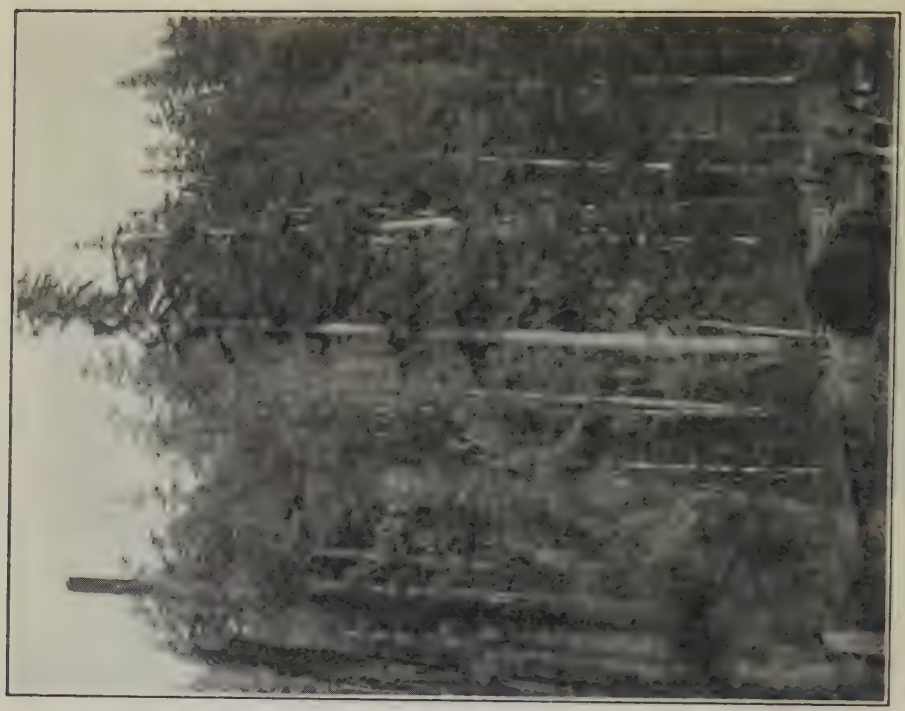
Tsuga canadensis (L.) Carr. **Eastern Hemlock**

Other common names: Hemlock, Canadian hemlock, hemlock spruce* (England), white hemlock.

French names: Pruche, pérusse (France), tsuga du Canada, sapin du Canada*.

Eastern hemlock averages $1\frac{1}{2}$ to 2 ft. in diameter and 60 to 70 ft. in height. The trunk is usually straight, but tapered much from the base upwards. In the open the tree is very branchy, but in dense stands it has a small, short crown. Its branchlets are very slender and flexible, and are roughened by the raised projections left by the dropped leaves. The roots are very shallow and spreading.

The bark is reddish-brown in colour and roughened with shallow furrows and narrow, scaly ridges.



Western hemlock (*Tsuga heterophylla*)

Eastern hemlock (*Tsuga canadensis*)

Photo. 8602. *B. R. Morton.*

Eastern Hemlock (***Tsuga canadensis***): trunk and bark

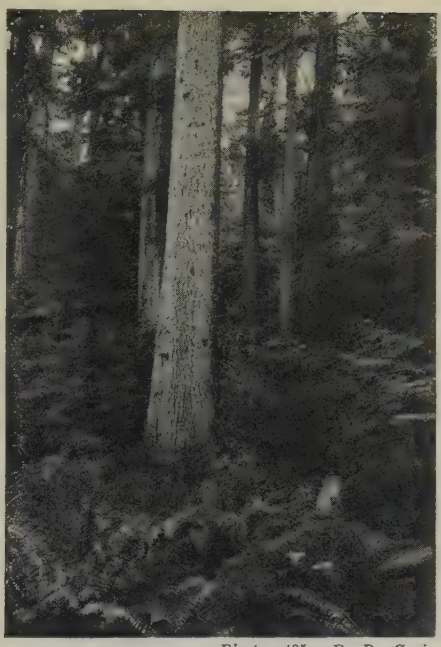


Photo. 485. *R. D. Craig.*

Western hemlock (***Tsuga heterophylla***): trunk and bark

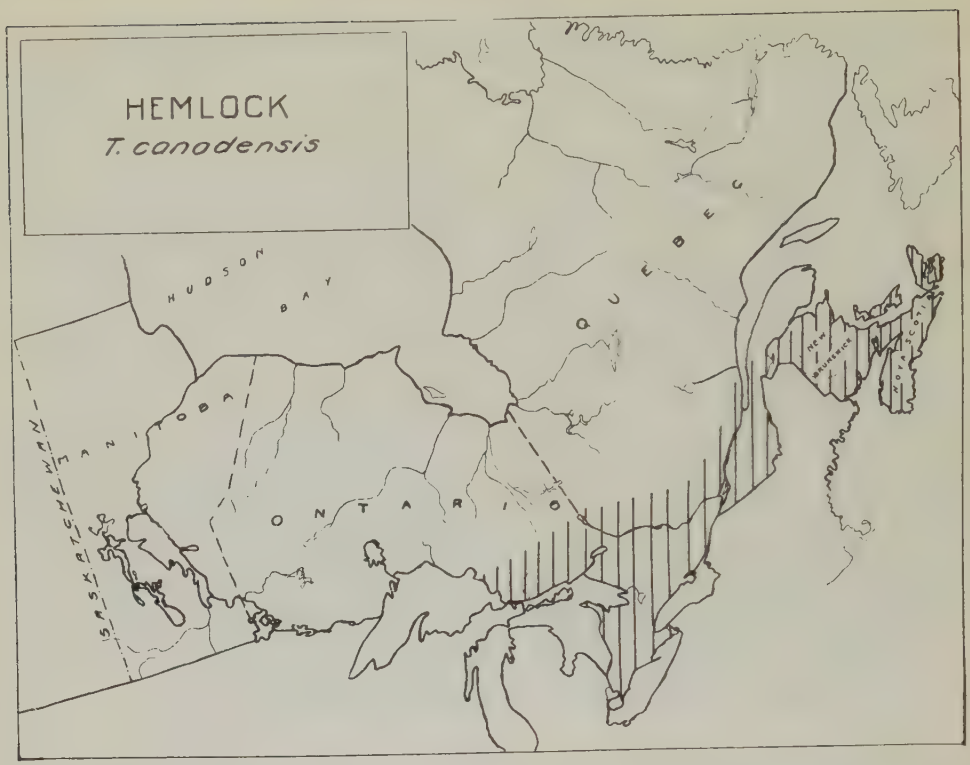
The leaves are flat, blunt, $\frac{1}{2}$ in. long, dark green on the upper side with pale lines beneath. They are distinctly stalked and each is attached to a small projection on the bark of the twig. They are twisted, and arranged in two distinct ranks. The fact that the leaves are distinctly stalked makes the tree readily distinguishable from many of the firs.

The cones are very small—$\frac{3}{4}$ in. long. They are stalked and hang downwards from the twigs. The scales are thin, oval, and tan in colour.

Eastern hemlock is found in the Maritime Provinces, in the valley of the St. Lawrence in Quebec, and in the southern part of Ontario as far west as lake Superior. Its range coincides closely with that of sugar maple and yellow birch. It is sometimes found in pure stands, but is more often mixed with pines or hardwoods. It occurs on a wide variety of soils, but demands a fair amount of moisture. It makes best growth on rich bottom lands.

The wood is fairly stiff, but rather harsh and splintery. It holds nails well. It is very subject to rot when placed in contact with the soil unless it has been treated with a preservative. It is not, therefore, the most desirable wood for railway ties or building sills, although large quantities are used for the former purpose. Where hemlock is kept dry or entirely immersed in water it is very durable.

The greater part of the hemlock lumber produced is used in its rough form for joists, rafters, sheeting, boxes, crates, concrete forms, and similar purposes, for which it is well adapted. The better grades are sometimes used for the interior finish and floors of inexpensive houses. It is used to a very limited extent in Canada for the manufacture of wood-pulp, but in the eastern United States, owing to the reduction of the supply of spruce, it is of considerable importance as a pulp producer.



Tsuga heterophylla (Raf.) Sarg. **Western Hemlock**

Other common names: Hemlock, British Columbia hemlock, Alaska pine*.

French name: Pruche (tsuga) de l'Ouest.

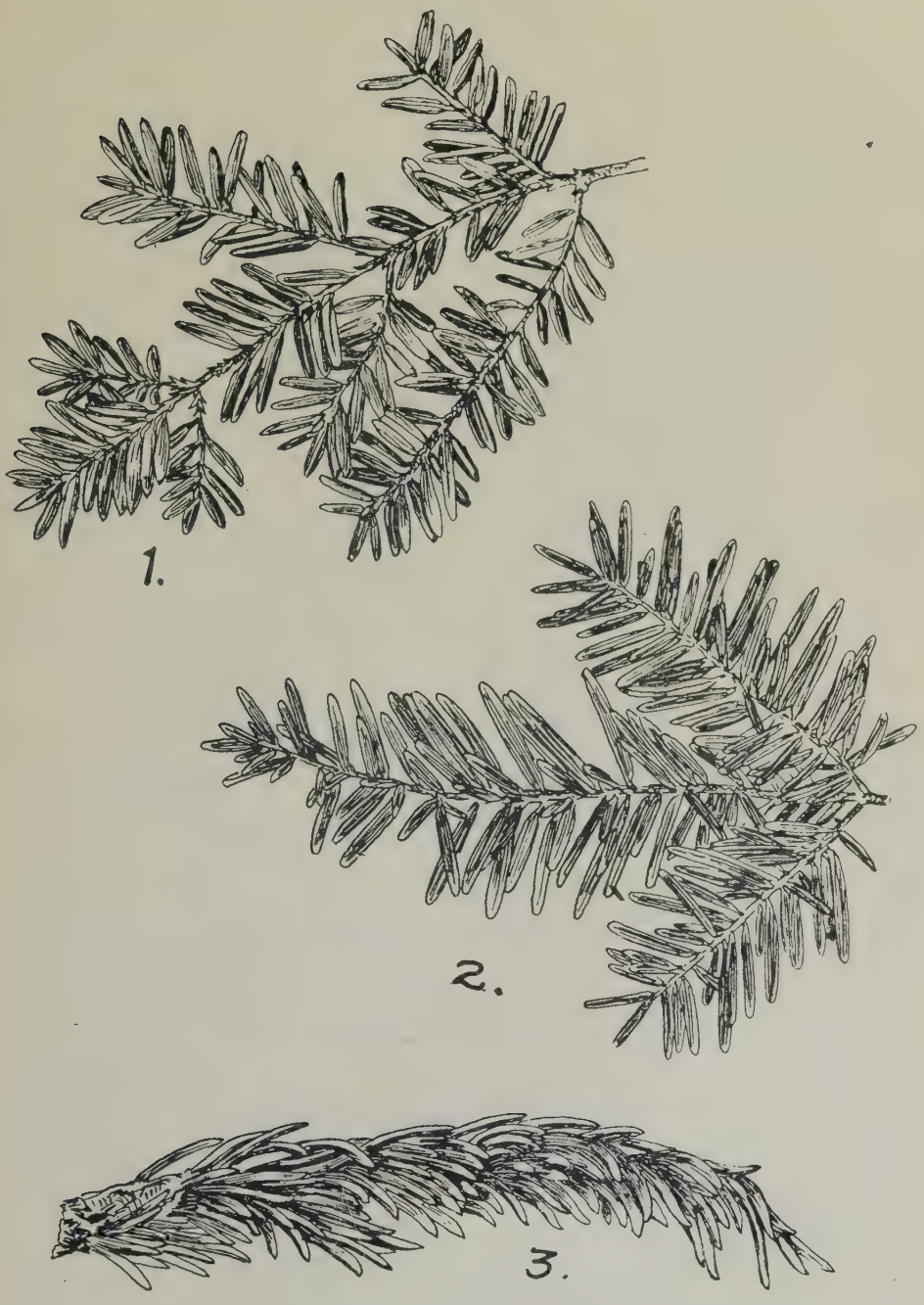
The Western hemlock is a large, rather slow-growing tree 125 to 150 ft. high and 3 to 4 ft. in diameter. The crown is narrow, pyramidal, and very dense. The branches are slender and the branchlets drooping. The tip is slender, whip-like, and drooping. The trunk is usually clear for three-quarters of its length in dense stands. The base of the trunk is often much swollen or thickened.

On young trees the bark is brownish and covered with fine scales; on older trees it is darker and deeply furrowed into wide, flat ridges. Owing to the thinness of its bark the tree is severely injured by fires.

The leaves, which vary much in size, are flat in cross-section, conspicuously grooved, and have blunt, rounded ends. Their stalks are thin and thread-like. They are arranged in two ranks and appear to be growing from opposite sides of the twig. The twig is more or less minutely hairy.

The cones are small, seldom over 1 in. in length, reddish-brown in colour, and without stalks. The scales, few in number, are longer than broad and coated with a faint down on the upper surface.

Western hemlock occurs throughout the Coastal and Interior Wet belts in British Columbia. In the interior it is found up to 5,000 feet elevation wherever there is abundant rainfall. It thrives best on deep, porous soils, but will grow in thin, poor ones where there is sufficient moisture. It seldom occurs in pure



HEMLOCK LEAVES AND TWIGS

1 Eastern hemlock (*Tsuga canadensis*). 2 Western hemlock (*Tsuga heterophylla*). 3 Mountain hemlock (*Tsuga Mertensiana*).

stands but is usually mixed with Douglas fir, Sitka spruce, and Western red cedar at lower elevations, and mountain hemlock and the various firs at higher ones.

The wood of the Western hemlock is moderately strong, of fine even grain, light in weight and colour, and odourless when dry. Under proper drying conditions it does not shrink to an abnormal extent. It is sufficiently firm and hard to take a good polish, yet it is not too hard to be easily worked. It takes paint, stain, and glue well. Except when used in very thin pieces it has not the tendency of Eastern hemlock to split. Under water, or where kept continually dry, it is very durable but is not so satisfactory in positions where it is exposed to dampness.

Western hemlock is manufactured into the common forms of lumber and is well suited for all but the heaviest construction work. It is suitable for scantling, joists, siding, flooring, ceiling, and laths. When sawn in a certain manner known as slash-grain it has a very handsome figure, and since it takes a high polish and is easily stained it makes handsome interior trimmings and panels. It is also suitable for sashes and doors, as well as turned stock.

Considerable quantities are used in the manufacture of boxes, especially for stout packing cases, piano boxes, and other containers of heavy construction.

Tsuga Mertensiana (Bong.) Sarg. **Mountain Hemlock**

Other common name: Black hemlock.

French name: Tsuga de Patton.

The mountain hemlock is a small tree 25 to 50 ft. high and 10 to 20 in. in diameter. The trunk, except when much crowded, is not clear for any length but usually has branches down to the ground. It has many, slender, lash-like, drooping branchlets.

The branchlets often have erect side branches.

The bark is a dark reddish-brown and is roughened by hard, narrow, rounded ridges.

The leaves are blunt-pointed, plump, or round in cross-section and stalked. They stand out all around the branch but seem somewhat thicker on the upper side. They resemble the leaves of spruce rather than those of hemlock.

The scales of the winter buds are tipped with an awl-shaped projection.

The cones are 1 to 3 in. long and $\frac{3}{4}$ in. in diameter when closed. They are larger than those of the Western hemlock. The scales are broader than long and from yellowish-green to bluish-purple or brown in colour.

This tree is found throughout the Coastal belt in British Columbia, usually near timberline at altitudes from 2,500 to 6,000 feet, but sometimes descending nearly to sea-level in the more exposed and wetter situations in the north. It is also found in the mountains of the Columbia and Skeena systems at high altitudes.

Wherever this tree is found with Western hemlock it is cut and marketed with that wood, but it is of slight commercial importance in Canada.

THE TRUE FIRS

There are twenty-three species of true fir (*Abies*) recognized, four of which are found in Canada. Three are western species, and the other may be described as an eastern species which extends into the West.

The crown is usually pyramidal, dense, and narrow at the top. The branches are slender, horizontal, and in more or less regular whorls.

The leaves are flat and blunt at the tip. Sometimes near the end of vigorous branchlets they are sharp-pointed. In arrangement they are two-ranked; that is, they appear to grow more or less distinctly from two opposite sides of the twig. On the more vigorous twigs, especially on those near the top of the tree, this arrangement may not be so apparent.

The hemlocks and the Douglas fir (not a true fir) also have this two-ranked arrangement.

The cones stand erect. The scales are shed at the same time as the seed, and leave the central spike-like axis erect and bare. The cone of no other native evergreen breaks in this way.

Abies balsamea (L.) Mill. **Balsam Fir**

Other common names: Fir, balsam, white fir*, var (Maritime Provinces), silver pine*, white spruce* (Cape Breton), Canadian fir (England).

French names: Sapin baumier, sapin blanc, sapin rouge.

The balsam fir is one of the most widely distributed trees in Canada, ranging from Nova Scotia to Labrador along the east coast, then westward and northward through New Brunswick, Quebec, and Ontario to Hudson bay, the Prairie Prov-

Photo. 11007. *R. H. Campbell.*

Balsam fir (*Abies balsamea*)

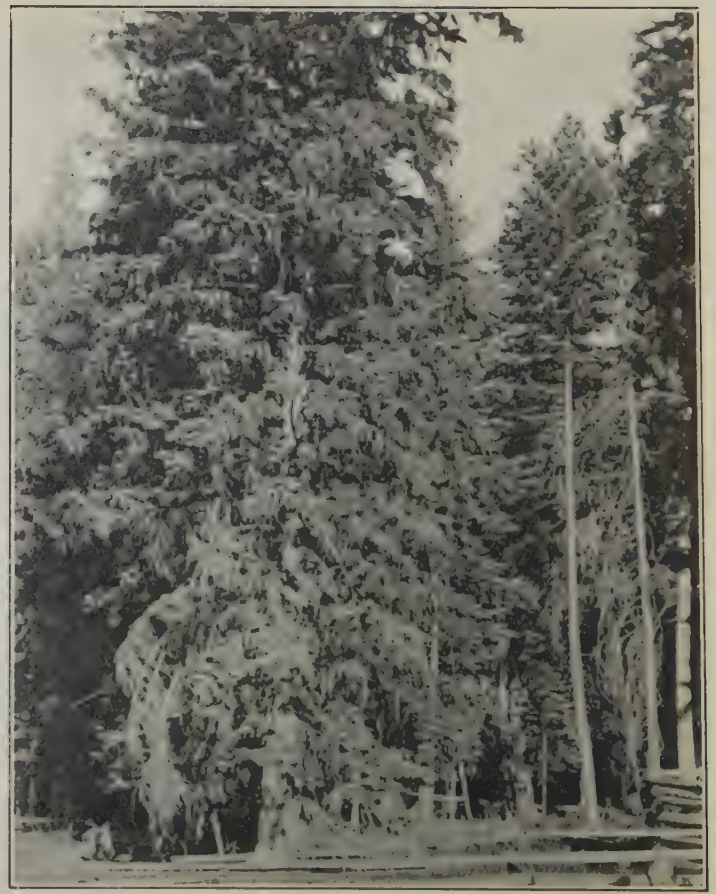


Photo. 2276. *G. Cromie.*

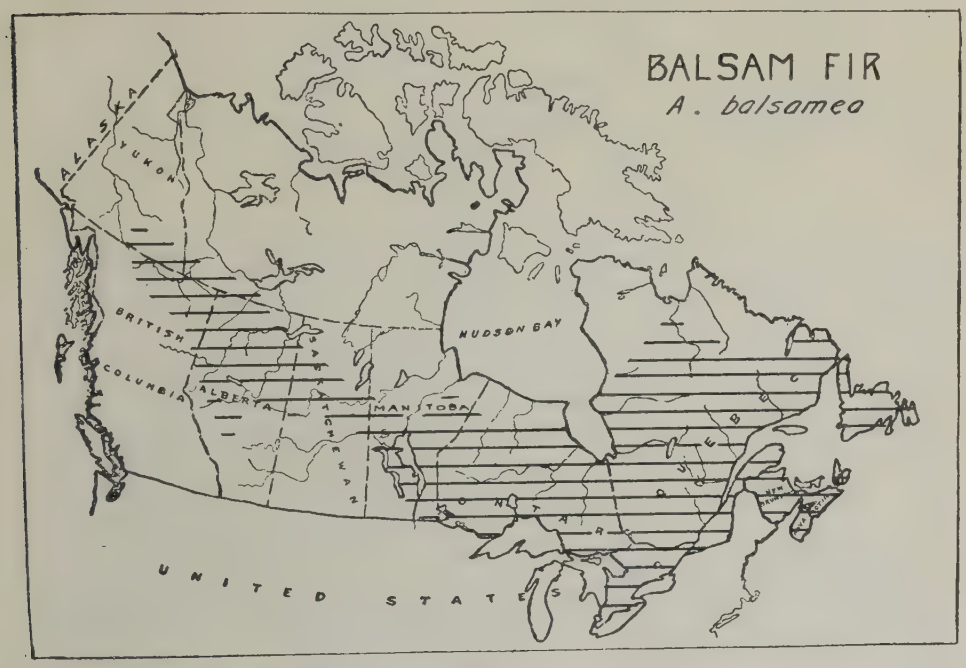
Alpine fir (*Abies lasiocarpa*)

inces, and Great Slave lake, and thence northward almost to Alaska. It is found in pure stands or mixed with red spruce in the East and with black and white spruce and tamarack throughout all its range. In the East it grows in the more moist situations, but in the North it is found on bare, rocky hillsides.

It is a tree 50 to 60 ft. in height and 1 to 2 ft. in diameter. The regular whorls of horizontal branches produce a broad, symmetrical, pyramidal crown of considerable depth in proportion to the length of the clear trunk. Where crowded the crown is short, and narrow, and sharp. The root-system is shallow, and the tree is easily overthrown by winds.

The bark is very smooth, and thin, and conspicuously marked with raised blisters, or pockets, containing oily resin or balsam. The colour is greyish-brown.

The leaves are $\frac{1}{2}$ in. long, dark green and shiny, pale below, flat, grooved, and very blunt or sometimes slightly notched at the tip. They are without stalks and are not curved. Usually the leaves are divided into two ranks along the twig as in hemlock, but on leading shoots and fruit-bearing twigs they have generally a more upright, bristling arrangement.



The twigs frequently come out from the branch in pairs and almost opposite each other. They are smooth and, after the leaves have dropped off, are marked with small, circular scars left by the base of the leaf. The winter buds are small, covered with resin, and not pointed. These features aid in distinguishing it from the Douglas fir, which has pointed buds that are free from resin.

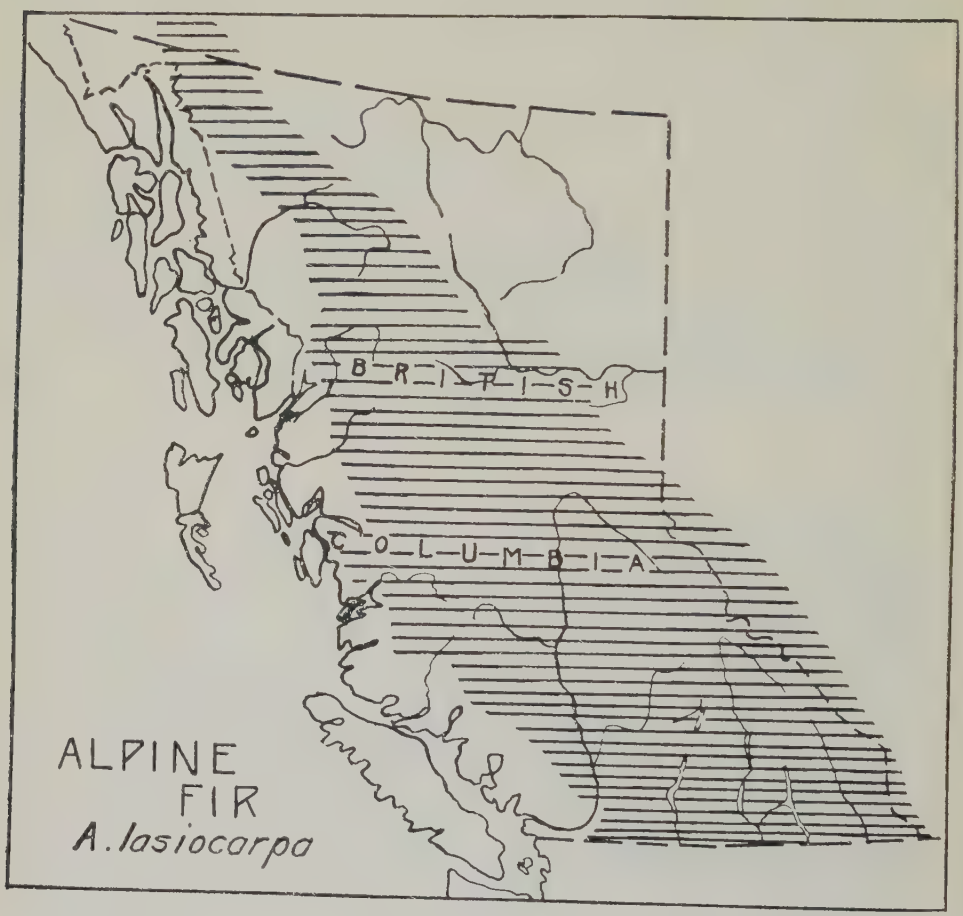
The cones are 2 to 4 in. long, and 1 in. broad and are purplish in colour. They stand erect on the branch, as do those of all true firs, and, when ripe, their scales drop off leaving the core, or axis, standing.

The balsam fir, though in general inferior to the spruce, with which it associates in our forests, is a tree of great economic importance. With the tremen-

dous expansion of the pulp and paper industry, the cut of this wood has increased remarkably. At present it forms approximately one-quarter of the wood used in the pulp-making industries of this country.

Although the chief commercial value of balsam fir lies in the direction of the pulp industries, it is also an important lumber, lath, and shingle producer.

The wood of balsam fir is softer, more brittle, and less strong than that of spruce and therefore is used largely where strength is not of paramount importance. It is extensively used in the manufacture of cases, crates, and cheese boxes, and to a certain extent for sash, doors, and siding. It is also used to a small extent in cooperage.



Abies lasiocarpa (Hook.) Nutt. **Alpine Fir**

Other common names: Mountain fir, white balsam, white fir*, Western balsam fir, caribou fir (Northern British Columbia), Rocky Mountain fir.

French name: Sapin concolore.

The alpine fir, as the name denotes, is a tree of the mountains. It is found in British Columbia, Alberta, and Yukon territory at elevations of 2,000 to 7,000 feet, except that it does not occur on Vancouver island, the Queen Charlotte

islands, and the southern coastal region. In the interior it is associated with Douglas fir, lodgepole pine, and Engelmann spruce in its lower range, and with limber and white-bark pine at timberline. This species is often confused with amabilis fir (*A. amabilis*).

The alpine fir, when well developed, averages 1 to 2 ft. in diameter and 60 to 70 ft. in height. It is a slow-growing tree. The crown is extremely narrow and spire-like. The branches are stubby and form a dense growth. Dead lower branches are frequently found hanging down along the trunk. The roots are shallow.

The bark is smooth and marked with resin blisters. The smooth part is light grey in colour. The base of the tree is frequently roughened by narrow cracks.

The twigs are downy, and, when the leaves have dropped, marked with small circular scars. The buds are blunt and covered with resin.

The leaves are $1\frac{1}{4}$ to $2\frac{1}{4}$ in. long, stalkless, and flat. They are whitish when young and deep blue when older. The tips of the leaves are notched except on some of the top branches. They are characteristically curved and twisted toward the upper side of the branch.

The cones are $2\frac{1}{2}$ to 4 in. long, $1\frac{1}{2}$ in. in diameter, and intensely purple in colour. They stand erect on the branch and shed their scales when ripe, as do the cones of all true firs.

This is the most important lumber-producing species of its genus in the Rocky mountains, where it is often sold mixed with Engelmann spruce. It is used chiefly for rough building purposes and mine timbers. It is also suitable for boxes and crates and is valuable as a pulpwood.

Abies grandis Lind. **Grand Fir**

Other common names: Lowland fir, white fir*, western balsam, silver fir*, larch* (British Columbia), giant fir, lowland white fir.

French name: Sapin grandissime.

The range of grand fir is very limited and in Canada it is found only in the southern coastal region and to a limited extent in the interior wet belt in British Columbia. It prefers moist, well-drained situations and is, therefore, chiefly found along stream bottoms and on lower slopes. It is seldom found in pure stands, being usually mixed with Douglas fir, Western red cedar, Western hemlock, and black cottonwood.

The grand fir averages 2 to 3 ft. in diameter and 100 to 125 ft. in height. The trunk is tall, straight, and clear, except when growing in the open. The branches have a tendency to droop slightly and then turn up at the ends. The lower branches on old trees often hang down, causing the crown to appear wider near the middle than at the base.

The bark is rather thick, for a fir, and often cut by narrow furrows into hard, sharp, horny ridges. On young trees it is smooth and brown with whitish patches. It is marked with resin blisters.

The leaves, like those of the hemlock, appear to grow from opposite sides of the branch and are $1\frac{1}{4}$ to $2\frac{1}{4}$ in. long. In the upper part of the tree they are not quite so long and are usually more crowded and bristling in their arrangement. Like the leaves of other firs these are stalkless, flat, usually notched at the tip, and conspicuously white on the underside. On vigorous shoots they are sometimes four-sided.

The buds are blunt and covered with resin.

	TRUE FIRS (*Abies*)			DOUGLAS FIR (*Pseudotsuga*)		HEMLOCKS (*Tsuga*)		
	BALSAM FIR (*Abies balsamea*)	ALPINE FIR (*Abies lasiocarpa*)	GRAND FIR (*Abies grandis*)	AMABILIS FIR (*Abies amabilis*)	DOUGLAS FIR (*Pseudotsuga taxifolia*)	HEMLOCK (*Tsuga canadensis*)	WESTERN HEMLOCK (*Tsuga heterophylla*)	MOUNTAIN HEMLOCK (*Tsuga Mertensiana*)
BARK	Greyish-brown and smooth, with raised blisters containing resin. Old trees roughened at the base.	Thin and smooth. Smooth parts light grey in colour and blistered. Base marked with narrow cracks.	Smooth and brown with whitish patches and blisters on young trees. Old trees marked by narrow fissures and sharp, hard, horny ridges.	Very thin, grey, smooth and unbroken. Marked with large white patches and blisters.	Smooth and blistered when young but becomes deeply ridged with reddish scales. One of the heaviest barked trees in Canada.	Reddish-brown and roughened by shallow furrows and narrow, scaly, joining ridges.	Fine brownish scales on young trees. Older trees are deeply furrowed and have wide, flat ridges.	Dark reddish-brown, roughened by hard, narrow, rounded ridges.
TWIGS and BRANCHES	Twigs smooth and produced more or less regularly in pairs from the opposite sides of the branch. Branches come off from trunk in whorls.	Branches stubby and form a dense growth. Lower branches dead and hang down along the trunk.		Twigs yellowish and minutely hairy.	Branches have more or less of a droop.	Twigs slender and roughened by raised projections left after the leaves drop.	Twigs similar to those of the hemlock of the East but more or less minutely hairy.	Twigs similar to those of the eastern hemlock but more slender and whiplike. Branches often have erect side twigs.
BUDS	Small, blunt and covered with resin.	Small, blunt and covered with resin.	Small, blunt and covered with resin.	Rounded and covered with resin.	Sharp-pointed, reddish-brown and not covered with resin.			Bud scales tipped with an awl-shaped projection.
LEAVES	1 to 1½ in. long. Flat, not curved or stalked. Blunt, sometimes slightly notched. Usually arranged in two ranks like those of the hemlock but on upper twigs often bristling. Circular flat scar left on the twig by the leaf. Dark green and shiny.	1¼ to 2¼ in. long. Blunt and notched like those of the balsam fir, except that they are usually crowded towards the upper side of the twig. Bluish tinge.	1¼ to 2¼ in. long, shorter on cone bearing twigs, otherwise like those of the balsam fir.	1¼ in. long as a rule. Side leaves stick up, point forward, and are closely pressed together to form stiffer and more bristling branches than the other firs.	¾ in. or more in length. Dark green, flattened, sharp-pointed and not distinctly stalked. Not so distinctly arranged in two ranks as those of the balsam fir. On dropping off they leave a circular scar on a raised base.	½ in. long, flat and blunt, dark green with pale lines beneath. Distinctly stalked and borne on small projections of the bark. Twisted to form two ranks.	Grooved and flat in cross-section. Stalked and two-ranked.	Round in cross-section. Stand out all around the twig.
CONES	2 to 4 in. long. Stand erect on the branch. Scales usually shed before the cone drops. Purplish colour.	Similar to balsam fir, perhaps a little thicker, though, as a rule. Stand erect.	Similar to those of the alpine fir. Green colour. Stand erect.	Larger than those of the other firs, 4 to 5 in. long and 2 to 2½ in. thick. Stand erect.	2 to 4½ in. long. Bracts extending beyond the scales are conspicuous and three-pointed. They do not stand erect.	¾ in. long, stalked and hang down from the ends of the twigs.	Seldom over 1 in. long. Stalkless and hang down. Scales longer than broad.	1 to 3 in. long. Stalkless and hang down.

The cones are 2½ to 4 in. long and 1 to 1⅓ in. in diameter. They are yellowish-green in colour and stand erect on the branch.

This tree is not of great commercial importance in Canada. It is ordinarily used for rough lumber, or box and crate material, or sold for pulpwood.

Abies amabilis (Dougl.) Forbes **Amabilis Fir**

Other common names: Red fir, alpine fir, larch* (British Columbia), silver fir, white fir.

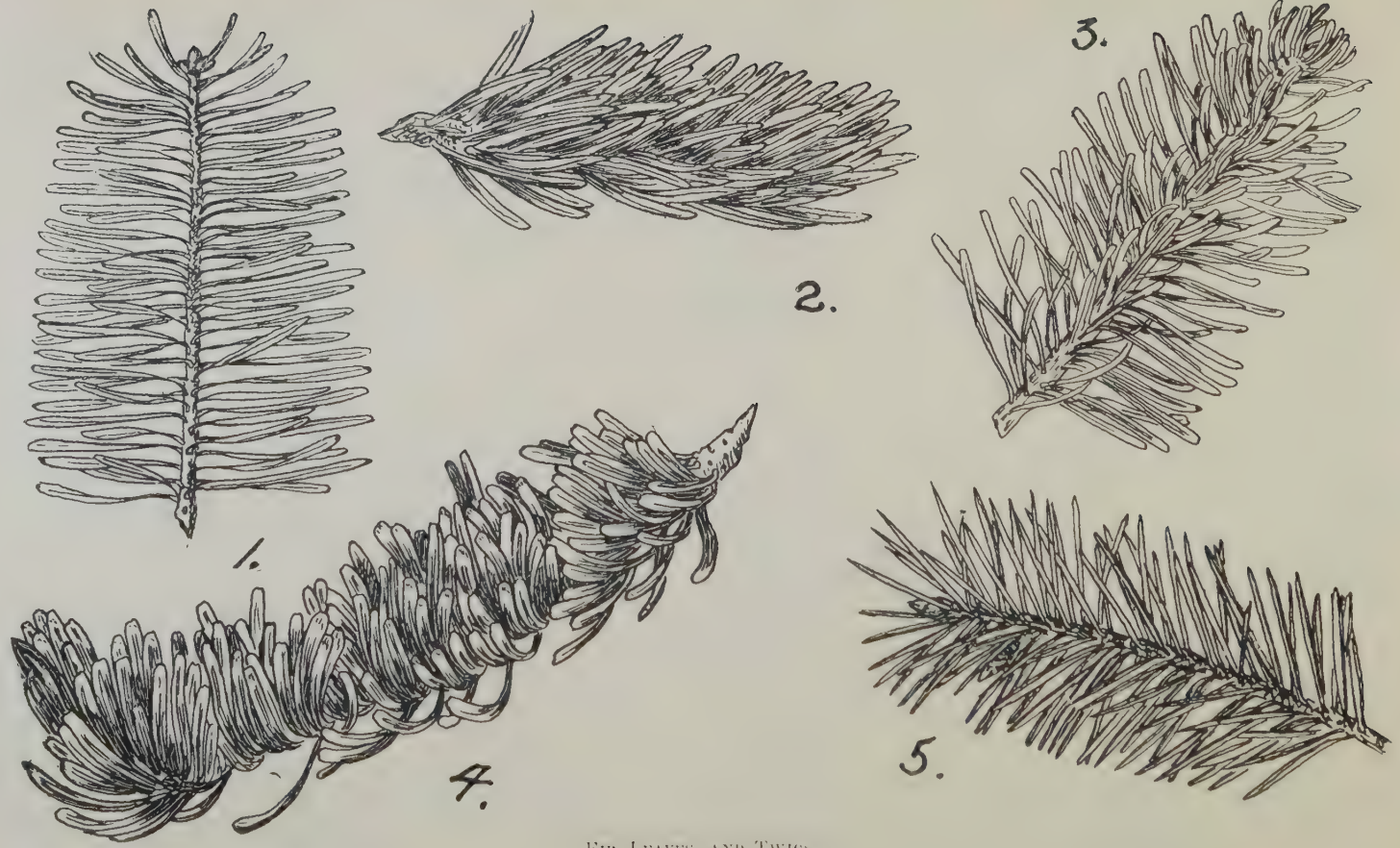
French name: Sapin gracieux.

The amabilis fir extends from Alaska southward through the whole length of British Columbia, but is mostly confined to the western slope of the Coast range and to Vancouver island. It does not occur on the Queen Charlotte islands. It grows on the lower slopes, benches, and flats on well-drained, gravelly sand or sandy loams. Occasionally it is found in pure stands but more often is mixed with Douglas fir, Western hemlock, and Western white pine.

The amabilis fir grows 150 to 170 ft. high and 3 to 4 ft. in diameter. In the forest it has a short, conical crown, but in the open the crown extends to the ground. The branches towards the bottom of the crown droop markedly.

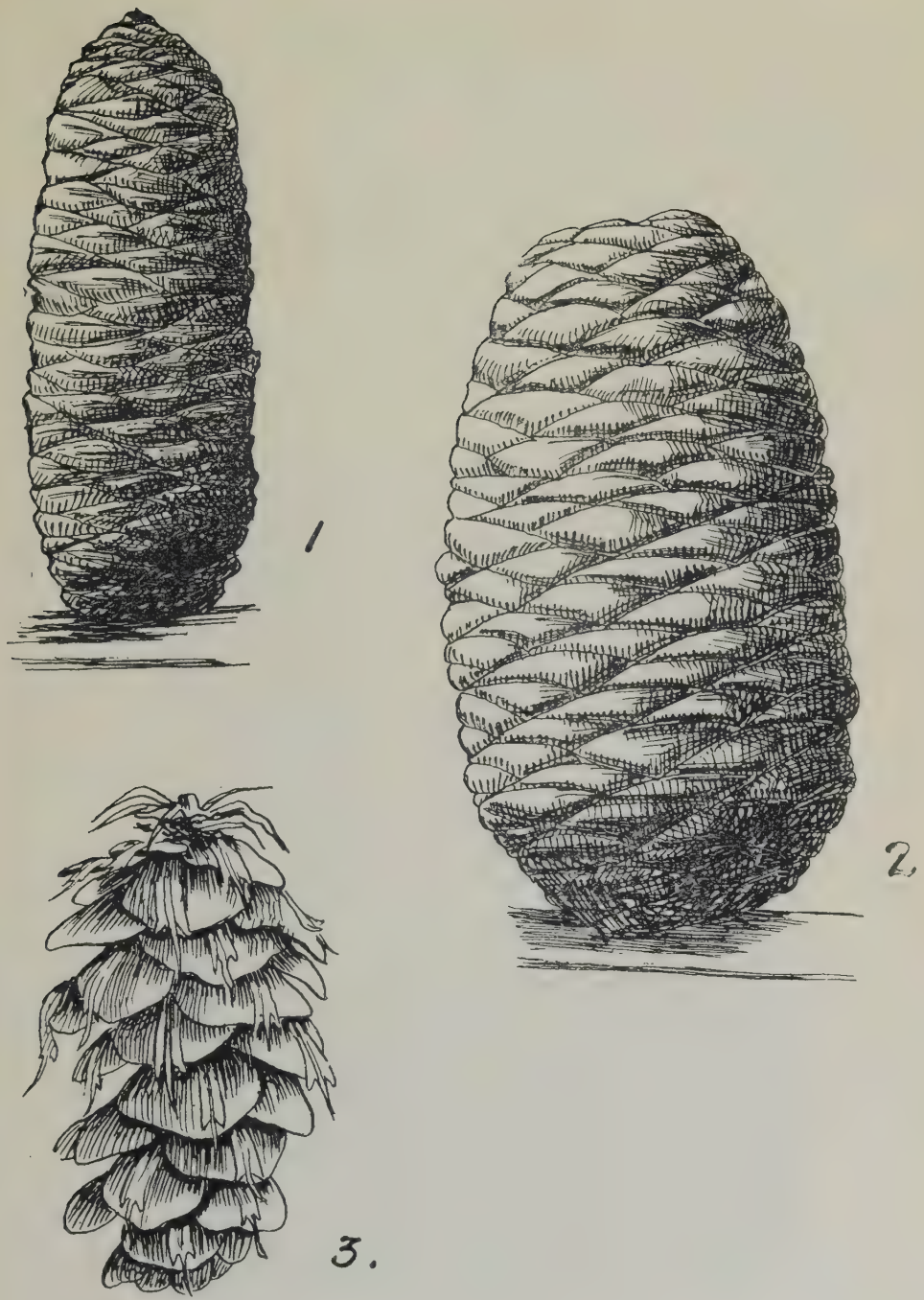
The bark is thin, grey, smooth, and unbroken except in very large trees. It is conspicuously marked with large, white patches.

The twigs are yellowish-brown, minutely hairy, and scarred with the marks left by the bases of the fallen leaves. The winter buds are rounded and covered with resin.



FIR LEAVES AND TWIGS

1 Balsam fir (*Abies balsamea*). 2 Amabilis fir (*Abies amabilis*). 3 Lower twig of the same tree. 4 Alpine fir (*Abies lasiocarpa*). 5 Douglas fir (*Pseudotsuga taxifolia*).



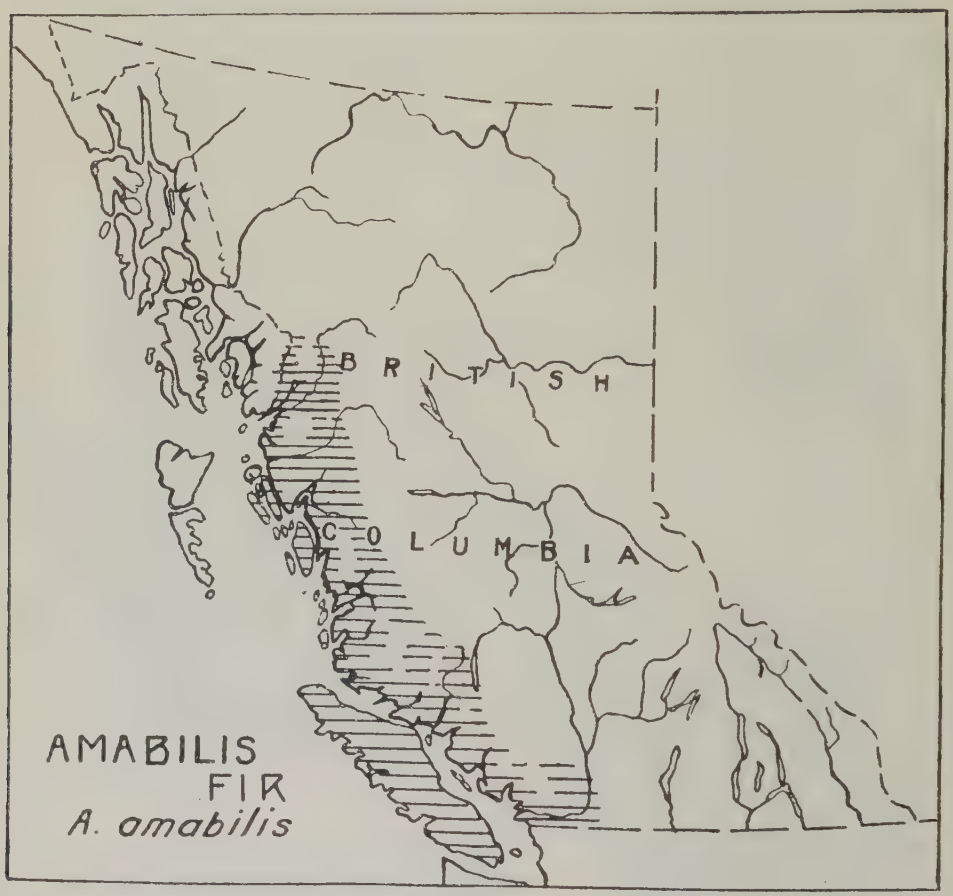
FIR CONES

1 Balsam fir (*Abies balsamea*). 2 Amabilis fir (*Abies amabilis*).
3 Douglas fir (*Pseudotsuga taxifolia*).

The leaves are about 1¼ in. long, stalkless, flat, notched at the ends, and whitish beneath. They have the appearance of being pulled around toward the upper side and are closely pressed together to form a stiff, fuzzy branch.

The cones are 4 to 5 in. long and 2 to 2½ in. thick, and dark purple in colour. They stand upright on the branch.

The wood of the amabilis fir is similar to that of the other true firs, being light, soft, and odourless. It is well suited for pulpwood, interior finish, woodenware, boxing and crating, and light construction.



THE DOUGLAS FIR

Three species of this genus (*Pseudotsuga*) are known, one a native of Japan and the other two natives of the western portion of this continent. The Douglas fir (*Pseudotsuga taxifolia*) is the only one of importance, also the only one native to Canada.

They all produce hard, heavy, strong wood which resembles hard pine and is used for the same purposes. The name "false hemlock" is due to the resemblance of the flat, somewhat stalked, two-ranked leaves to those of the true hemlock (*Tsuga*). The Douglas fir resembles the true firs (*Abies*) in having

blisters or resin pockets on the young bark, also in having cones provided with long bracts which project beyond the scales. They can easily be distinguished from the firs by the fact that their cones hang down and do not stand erect on the branch.

Pseudotsuga taxifolia (Lamb.) Brit. **Douglas Fir**

Other common names: British Columbia fir, red fir, yellow fir, Douglas spruce*, Douglas pine*, Oregon pine*, Oregon spruce*.
French names: Sapin de Douglas, pin de Douglas*, Douglas.

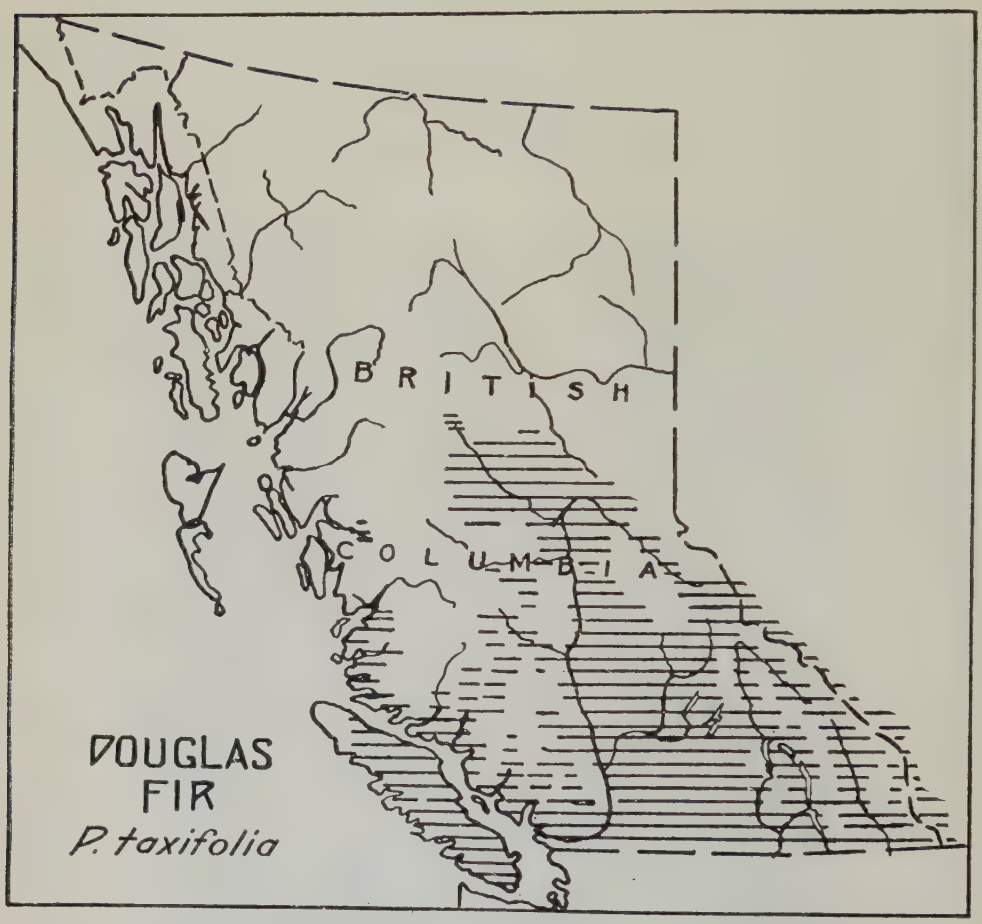
Douglas fir is the largest tree in Canada. It usually attains a height of 150 to 200 feet, with a diameter from 3 to 6 feet, but is sometimes found reaching heights of over 300 feet and diameters up to 15 feet. The trunk is straight and free of limbs for 70 feet and more. The crown is sharply pyramidal at first, becoming more or less flat in old trees. The branches have many long, hanging side branchlets.

Photo. Special.

Douglas fir (*Pseudotsuga taxifolia*)

The bark is thin and smooth at first but later becomes very thick and deeply furrowed. It has the heaviest bark of any tree in Canada, sometimes 10 to 12 in. thick.

The leaves are flattened and sharp-pointed, dark green above, and pale beneath. They are slightly narrowed at the base but not distinctly stalked and, upon dropping off, leave the twig marked with round, raised scars. They are arranged in two ranks but not as distinctly so as those of the balsam fir. The buds are sharp-pointed and not covered with resin in the winter.



The cones are 2 to 4½ in. long and hang down instead of standing erect as in the true firs (*Abies*). The three-pointed bracts which are attached to the back of the scales are long and conspicuous.

In Canada this tree ranges from the east slope of the Rocky mountains in Alberta through to the coast in British Columbia. In Alberta it is found as far north as the headwaters of the Athabaska river, and in the interior of British Columbia its range extends to lakes Babine and Stuart. On the coast it grows as far north as Gardner canal, but the best commercial stands are on Vancouver island and the adjacent mainland.

As a source of the largest-sized structural timbers in commercial quantities, this species is unsurpassed. Douglas fir is obtainable clear from defect in large dimensions and has a very wide range of uses, but because of its strength and size is particularly outstanding as a structural timber. The heavier grades possess a high degree of durability. Its pronounced growth-ring figure, which may be emphasized or reduced by proper finishing, gives striking effects in interior woodwork, where the timber finds extensive uses. Flooring both for dwelling houses and for heavy dock construction, general building purposes, water-pipes, silos, cooperage, veneers and plywood, railway ties, telegraph poles, and railway car construction are some of its various channels of utilization.

Photo. 1925. *A. Knechtel.*

Western red cedar (*Thuja plicata*) and Douglas fir (*Pseudotsuga taxifolia*): trunks and bark

THE CEDARS

The cedars (*Thuja*) vary from medium-sized to large-sized trees. There are four species known, of which two are native to Canada and the United States. The other two are native to China and Japan, but are sometimes planted on this continent for decorative purposes. Many ornamental varieties have been produced by nurserymen. True cedars (*Cedrus*) are not native on this hemisphere.

The two native species differ widely in range; one is confined to British Columbia, and the other does not extend west of Manitoba.

The bark of all species is thin and shreddy. The wood is highly aromatic and is much used on account of its lightness and durability.

The foliage consists of tiny, overlapping, scale-like, evergreen leaves, which occur in pairs pressed to opposite sides of the twig. The branchlets are characteristically arranged in flat sprays.

The fruit is a tiny cone which matures in one year and sheds many small seeds. Each seed is almost surrounded by its two narrow, membraneous wings, except in the case of the Asiatic species which have larger and heavier seeds without wings.

Thuja occidentalis L. **Eastern White Cedar**

Other common names: Cedar, white cedar, Northern white cedar, Eastern cedar, arbor-vitae, American arbor-vitae.

French names: Thuya, cèdre, cèdre de l'Est, cèdre blanc.

The Eastern white cedar is found from eastern Nova Scotia and Prince Edward Island westward throughout New Brunswick, southern Quebec, and southern Ontario to the south end of James bay, and in Manitoba to the southern end of lake Winnipeg. It also occurs in an isolated patch near the north end of lakes Winnipeg and Winnipegosis.

It is usually found in swamps or moist situations, but will also grow readily on the thin soil of limestone ridges. It occurs in pure stands of considerable size, but also grows mixed with spruce, tamarack, black ash, and alder.

It is a small tree, averaging about 45 ft. in height and 1 ft. in diameter but sometimes reaches a height of 80 ft. and a diameter of 3 ft. The trunk is short and much tapered, and the crown is conical, dense, long, and narrow. When grown in the open the cedar has a very trim, artificial appearance, and is, therefore, much used for ornamental planting.

Photo. 10968. *R. H. Campbell.*

Eastern cedar (*Thuja occidentalis*): trunk and bark.

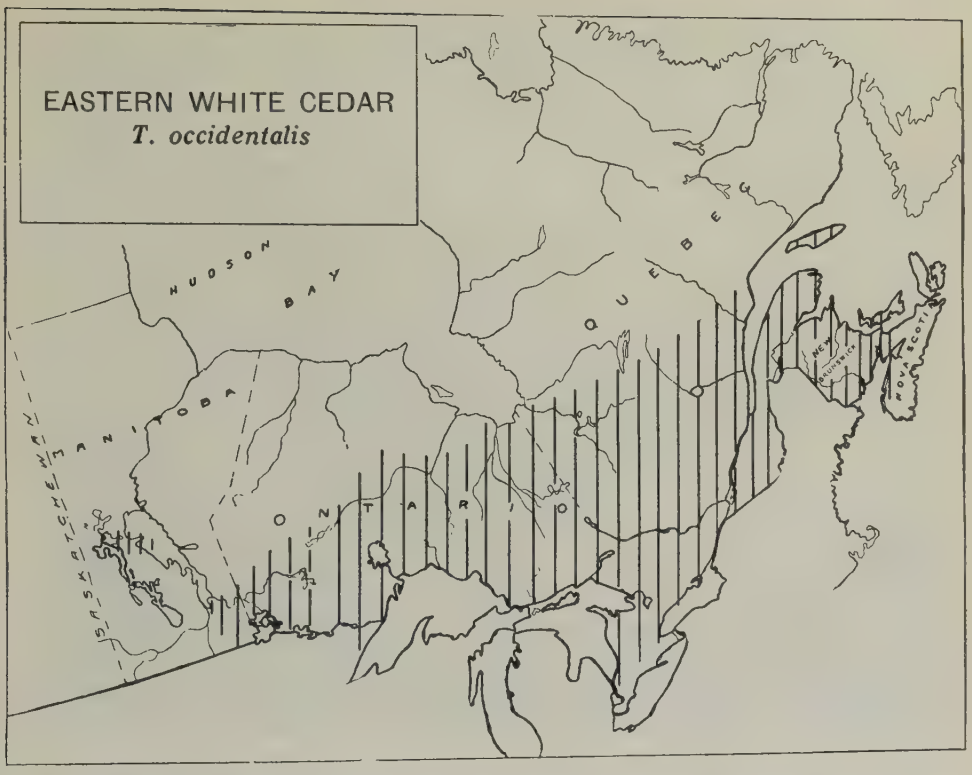
The bark is reddish-brown in colour, thin, and shreddy, often with a spiral twist.

The leaves are minute and scale-like, in pairs on opposite sides of the twig, and arranged in four rows. They are evergreen and completely cover the fan-like branchlets, overlapping like the shingles on a roof. When crushed they give out a very pleasant aromatic odour.

The cones are small, $\frac{1}{3}$ to $\frac{3}{4}$ in. long, composed of eight to twelve pale cinnamon-brown scales, which are arranged opposite in pairs. The seeds are winged and two in number under each scale.

The wood of the eastern white cedar is very light, soft, comparatively weak, brittle, fine, even- and straight-grained. It is pleasantly aromatic, resistant to moisture and changes in temperature, and easy to work. The colour is a light brown, which darkens with exposure.

The wood of this species is the lightest in weight of the Canadian timbers, and is one of the most durable of woods against decay. It is particularly valuable for poles, posts, fence-posts, shingles, boat-building, and, in fact, in any situation where timber is exposed to decay without great mechanical wear.



Its decay-resisting qualities make it valuable for railway ties on branch lines where the traffic is not heavy, and for tanks, cisterns, green-house construction, and other similar uses. Suitably treated, it may be used for pencils.

Thuja plicata D. Don — **Western Red Cedar**

Other common names: Western cedar, red cedar, British Columbia cedar, British Columbia red cedar, giant cedar, giant arbor-vitae.

French name: Thuya géant.

In Canada the Western red cedar is confined to British Columbia, being found on the Pacific coast northward as far as Alaska, and in the valleys of the interior wet belt. It is usually found on moist sites in deep, porous soil on cool slopes and in gulches. Occasionally it is found on comparatively dry sites; here, however, it is stunted. It occurs singly or in scattered patches. No pure stand of any size is found. In the north it usually associates with the Sitka spruce and yellow cedar and further south with the Western hemlock and Douglas fir.

It is a very large tree. Its height is 150 to 175 ft., or even more, and the diameter of the trunk reaches 4 to 8 ft. or more. The trunk is very much tapered, and the butt is usually very much swollen. Except where the tree is very much crowded, the branches remain on the lower part of the trunk until it reaches the diameter of $1\frac{1}{2}$ ft. or more, and thus produce a long, conical crown.

The bark is thin, and, like that of the Eastern white cedar, is divided by shallow grooves into broad ridges which break into long, loose shreds.

The leaves are similar to those of the Eastern white cedar and cover the flat sprays in the same manner. They may be mistaken for those of the yellow

Photo. 10986. *R. H. Campbell.*

Eastern white cedar (*Thuja occidentalis*)

Photo. 10989. *R. H. Campbell.*

Red juniper (*Juniperus virginiana*)

cypress at first sight, but a comparison will show them to have the points of the leaves less sharp and more closely pressed against the twig. Those of the yellow cedar have sharp, spreading points which make the sprays harsh and prickly to the touch.

The cones are about $\frac{1}{2}$ in. long with six fruiting scales.

Western red cedar is one of the most important timber trees of British Columbia. The wood is aromatic, varies from light to dark reddish-brown in colour, is very light in weight, and is very resistant to decay. In this last respect it is probably unsurpassed among the commercial softwoods. Its size gives it an advantage over the eastern species in the amount of long clear lumber which it furnishes. The light weight of the timber gives it high insulating value and its straight grain, uniformity, and very slight shrinkage give it easy working qualities and stability for interior woodwork. The wood takes paint well. It is suitable for all uses in which wood is subjected to decay except where strength is of prime importance. It is especially prized for mudsills, poles, piling, green-houses, house siding, and similar uses. More shingles are made from this wood than from any other tree in Canada. When properly treated, Western red cedar is being used for lead pencils.

61331—5½

THE JUNIPERS

The thirty-five or more known species of juniper (*Juniperus*) are widely distributed over the northern hemisphere and range from low shrubs to medium-sized trees. The majority of species are of small importance, commercially, because of their small size and irregular bole. The wood itself is of high technical quality.

The bark of all the species is usually thin and shreddy. The fruit is always a berry.

The dwarf, or common, juniper (*Juniperus communis*) is the most widely distributed one in Canada, being found across the Dominion from east to west. It is of importance only from a decorative standpoint, since it is a mere bush which is ordinarily distinguished from the other native species by its low habit of growth and radiating, upturned branches.

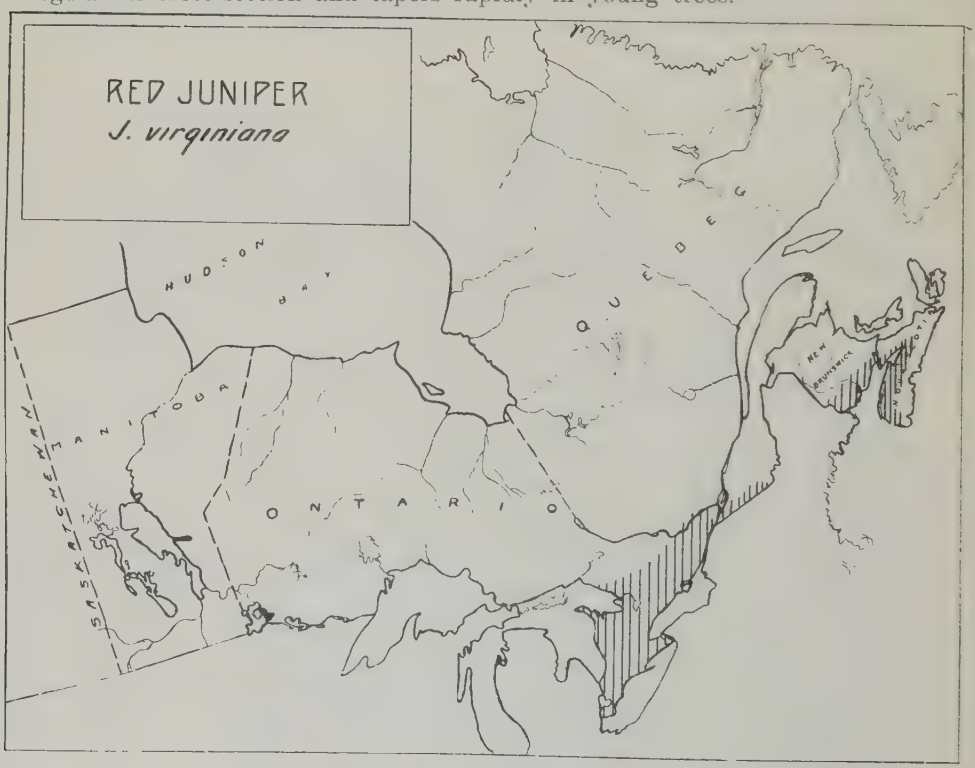
Juniperus virginiana L. **Red Juniper**

Other common names: Juniper, Eastern red cedar*, pencil cedar, pencil juniper.

French names: Génévrier rouge, cèdre rouge*.

The red juniper is found in Nova Scotia, in southern Quebec, and along the valley of the St. Lawrence to lake Huron and Georgian bay.

It is not a large tree in Canada, commonly 25 to 30 ft. in height and 7 or 8 in. in diameter. When young it has a narrow, compact, and pyramidal head, which becomes open and irregular as the tree becomes older. The trunk is very irregular in cross-section and tapers rapidly in young trees.



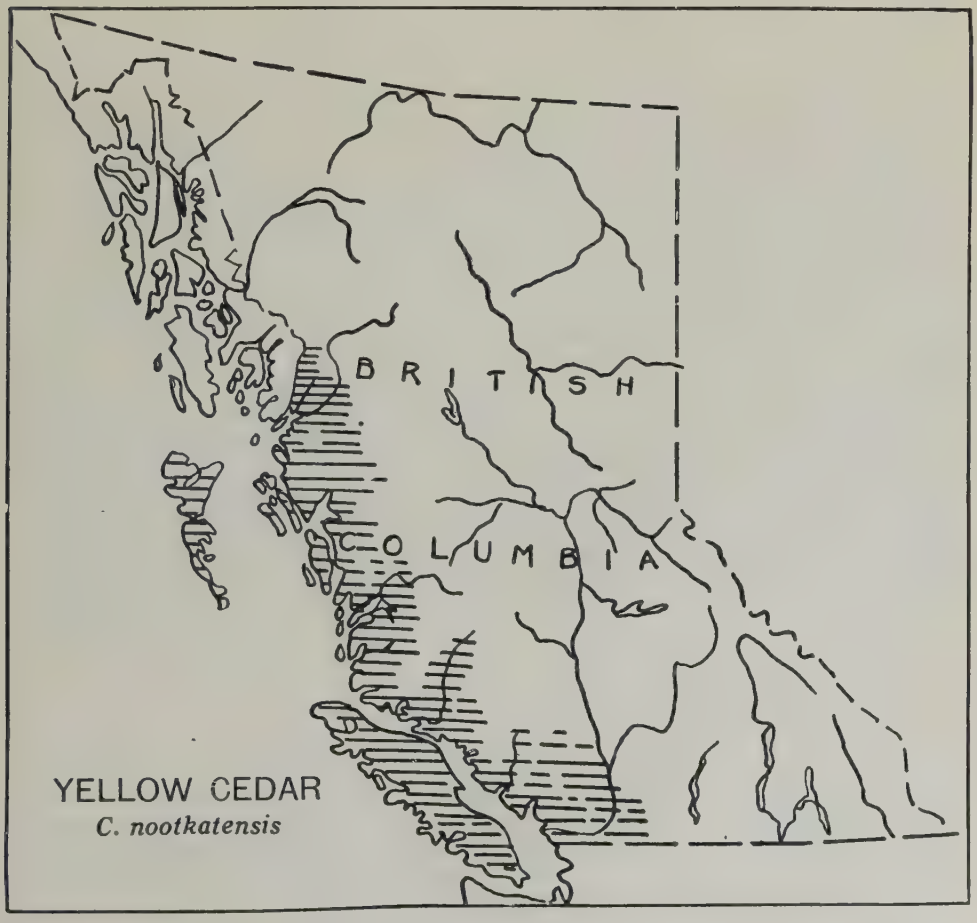
The bark is reddish-brown, stringy, and separates into shreddy strips.

The twigs are somewhat four-sided and are covered with minute leaves. They are not arranged in a flat, spreading spray like those of the Eastern white cedar (*Thuja occidentalis*) but have an irregular habit of growth.

The leaves are dark green, somewhat rusty-brown in winter, and have a characteristic odour when crushed. They are of two kinds. On young shoots, especially on young trees, they are as a rule awl-shaped, narrow, and sharp-pointed, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, in pairs and opposite or in threes and standing well out from the twig. The other form, which is more typical for the species and found on the older trees, is a minute scale-like leaf. These leaves are closely pressed to the twig, opposite, and in pairs, and lie overlapping. They are sharp- or blunt-pointed and often have a glandular dot on the back which is missing in the other form.

The fruit is a fleshy, dark-blue, bloom-covered berry the size of a pea, which has a peculiar, sweet, resinous taste. These berries are borne in large numbers on vigorous shoots of the female tree and remain on the tree all winter.

The red juniper is used locally in Canada for fence-posts. It seldom reaches sawlog sizes and is used mostly "in the round."



This is the wood once used for the better class of lead pencils, but the supplies are so restricted that other species are now required for this purpose. The lumber, though often of small dimensions and knotty, is valuable for "moth-proof" chests and wardrobes. On account of the attractive reddish-purple colour of its very durable heartwood it finds use in small novelties.

Juniperus scopulorum Sarg. **Rocky Mountain Juniper**

Other common names: Rocky mountain red cedar, Western juniper.
French name: Génévrier des montagnes rocheuses.

The Rocky Mountain juniper is found in the foot-hills of southern Alberta, and westward through southern British Columbia to the Pacific coast.

It is a small, bushy tree, ordinarily 10 to 20 ft. high, sometimes, in favourable, sheltered sites, reaching the height of 30 ft., and a diameter of 12 in.

In appearance this tree resembles very much the red juniper, or red cedar, of eastern Canada (*Juniperus virginiana*), and it was at one time thought to be a form of that tree. It differs from it chiefly in the fact that its berries require two years to mature and ripen, while those of the eastern tree require but one.

Its wood is like that of the other species of juniper and could be used for similar purposes, such as pencil slats and cabinet work.

THE CHAMAECYPARIS

Six species of *Chamaecyparis* are known, three in eastern Asia and three on this continent. Only one species, *Chamaecyparis nootkatensis*, occurs in Canada.

This small group of trees somewhat resembles in appearance the Thujas to which belong our Eastern white cedar or Arbor vitae and our Western red cedar. They differ, however, in having more nearly spherical cones instead of the narrow, elongated cones of the Thujas. The wood, too, is much heavier and harder, and lacks that characteristic cedar odour of the Arbor vitae.

The Asiatic species are of great importance in China and Japan. They can be distinguished from those of this continent by the lighter colour on the under side of the leaves and by their longer cones.

Chamaecyparis nootkatensis (Lamb.) Spach **Yellow Cedar**

Other common names: Yellow cypress, Alaska cypress, Alaska cedar*, Nootka cypress, canoe cedar.
French names: Cyprès jaune, faux cyprès de Nootka.

The yellow cedar is confined to the Pacific coast, and in Canada is found from Alaska to the international boundary, along the west slope of the Coast range and on the adjacent islands. In the southern coastal region it is seldom found at altitudes below 2,000 feet and its range extends to 5,000 feet. Towards the north it gradually descends until it reaches tide-water at Knight inlet. It is usually associated with amabilis fir and hemlock, replacing the red cedar where growing conditions become more difficult. It seldom occurs in pure stands; usually it is scattered or in patches.

It is a large tree, usually about 80 feet tall and 2 to 3 feet in diameter, although sometimes over 100 feet in height and 4 to 5 feet in diameter. The average size is smaller than that of Western red cedar, from which this species of Chamaecyparis is distinguished by its characteristic yellow aromatic wood.

The trunk is very much tapered. The crown is conical and narrow and has slightly drooping or horizontal branches. The small twigs or sprays are very

flexible and droop. The tip of the tree is very slender and often bent like the end of a whip.

The bark is very thin, ashy-brown outside and cinnamon-red within. The surface is broken by irregular, shallow fissures into flat ridges which flake off into narrow strips.

The leaves are scale-like, blue-green in colour, and resemble very much those of the Western red cedar. They are best distinguished from the latter by their distinctive, sharp, spreading points which make the spray harsh to the touch.

The cones are spherical in shape and about $\frac{1}{2}$ in. in diameter, a deep russet-brown with a whitish bloom. Two to four seeds are borne under each scale.

The wood is extremely resistant to decay. It is heavier than that of *Thuja* and is, therefore, more resistant to wear. It is useful for poles and piling, boat-building, green-houses, and generally for use under conditions favouring decay. Its firm uniform texture and very slight shrinkage make it suitable for fine cabinet work, interior finish, veneers, carving, patterns, and turnery. It is recognized as a superior wood for battery separators.

Photo. 10979. *R. H. Campbell.*

Juniper (*Juniperus communis*)

THE YEWS

Six species of yew (*Taxus*) are known, mostly shrubs. Two are native to Canada, one of which (*Taxus canadensis*) is a shrub, commonly known as "ground hemlock." Their leaves are flat, narrow, lance-shaped, sharp-pointed, and resemble those of the hemlocks in their two-ranked arrangement. The yews can, however, be readily distinguished from these trees by the difference of habit and the fruit, which latter in the case of the yews is berry-like.

The wood is very durable but is of little commercial importance in Canada. It is used to some extent for bows, small cabinet work, and novelties. The rose-red colour of the heartwood, which changes to a reddish-brown on aging, and the fine texture of the wood give it an attractive appearance.

Taxus brevifolia Nutt. **Western Yew**

Other common name: Pacific yew.
French name: If occidental.

West of the Coast range the Western yew has its habitat limited to the islands and mainland of the Pacific coast, and farther east to both sides of the Selkirk range from the Canadian Pacific railway to the international boundary. The yew is nowhere found in large stands, but usually in small groups or singly; it occurs comparatively rarely as a tree, more commonly as a shrub.

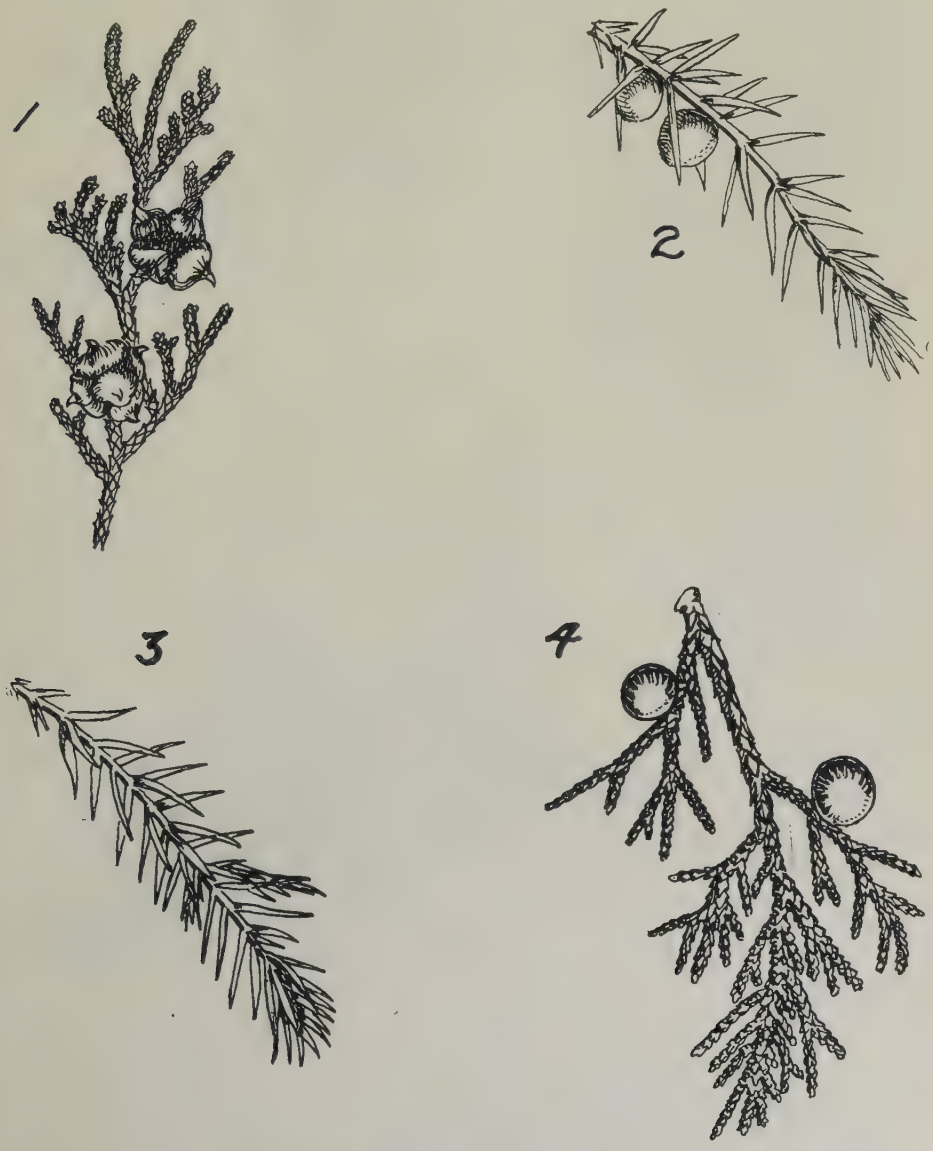
It is a small tree, ordinarily 18 to 25 ft. in height and 4 to 6 in. in diameter. The larger trees are found in the canyons near the streams or on moist flats. On the higher, dry, gravelly soils they are small. The wood is of little commercial importance in Canada.

The trunk is much tapered and usually fluted. The crown is conical and when growing in full light extends right to the ground. It is composed of many horizontal branches which bear many slender, drooping branchlets.

The trunk is covered with thin, purple scales which are easily removed, the underbark thus exposed being reddish-purple.

The leaves are flat, sharp-pointed, lance-shaped, yellowish-green, and soft to the touch. They are so twisted on the twig as to have a two-ranked, or feather-like, arrangement. They remain on the tree for several years.

The fruit when ripe is bright red, fleshy, and berry-like and contains a single seed which often protrudes beyond the outer covering.



JUNIPER AND YELLOW CEDAR LEAVES AND TWIGS

1 Yellow cedar (*Chamaecyparis nootkatensis*). 2 Common juniper (*Juniperus communis*). 3 and 4 Red juniper (*Juniperus virginiana*).

CEDAR AND YEW LEAVES AND TWIGS

1 Western yew (*Taxus brevifolia*). 2 Western red cedar (*Thuja plicata*). 3 Eastern white cedar (*Thuja occidentalis*).

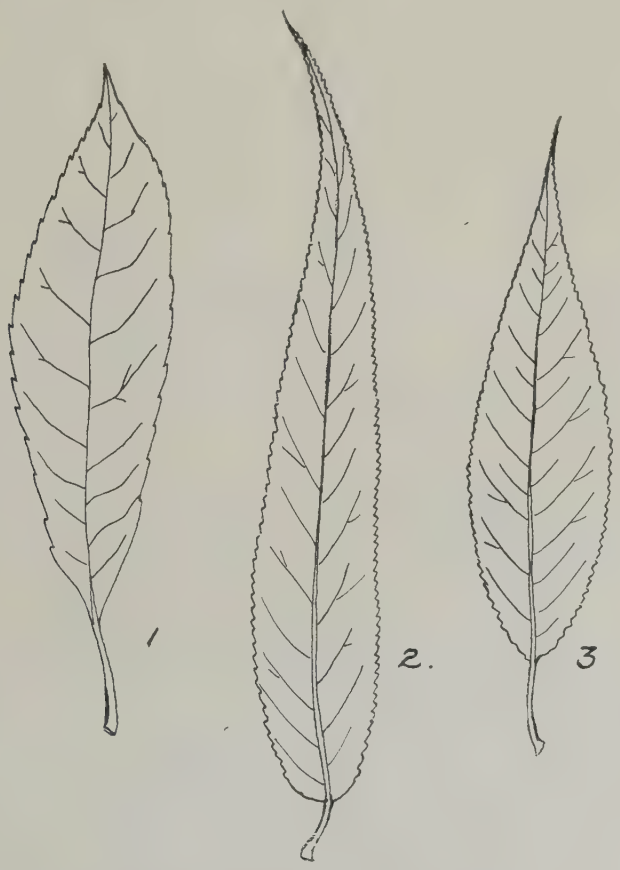
BROAD-LEAVED SPECIES

THE WILLOWS

The willow (*Salix*) is one of the most widely distributed trees in the whole world. Over one hundred and seventy species have been described, of which seventy-five are found in North America; of these fifty or more are found in Canada. Owing to the fact that they hybridize among themselves the varieties and crosses produced are seemingly without number, and this makes the separation of the species extremely difficult.

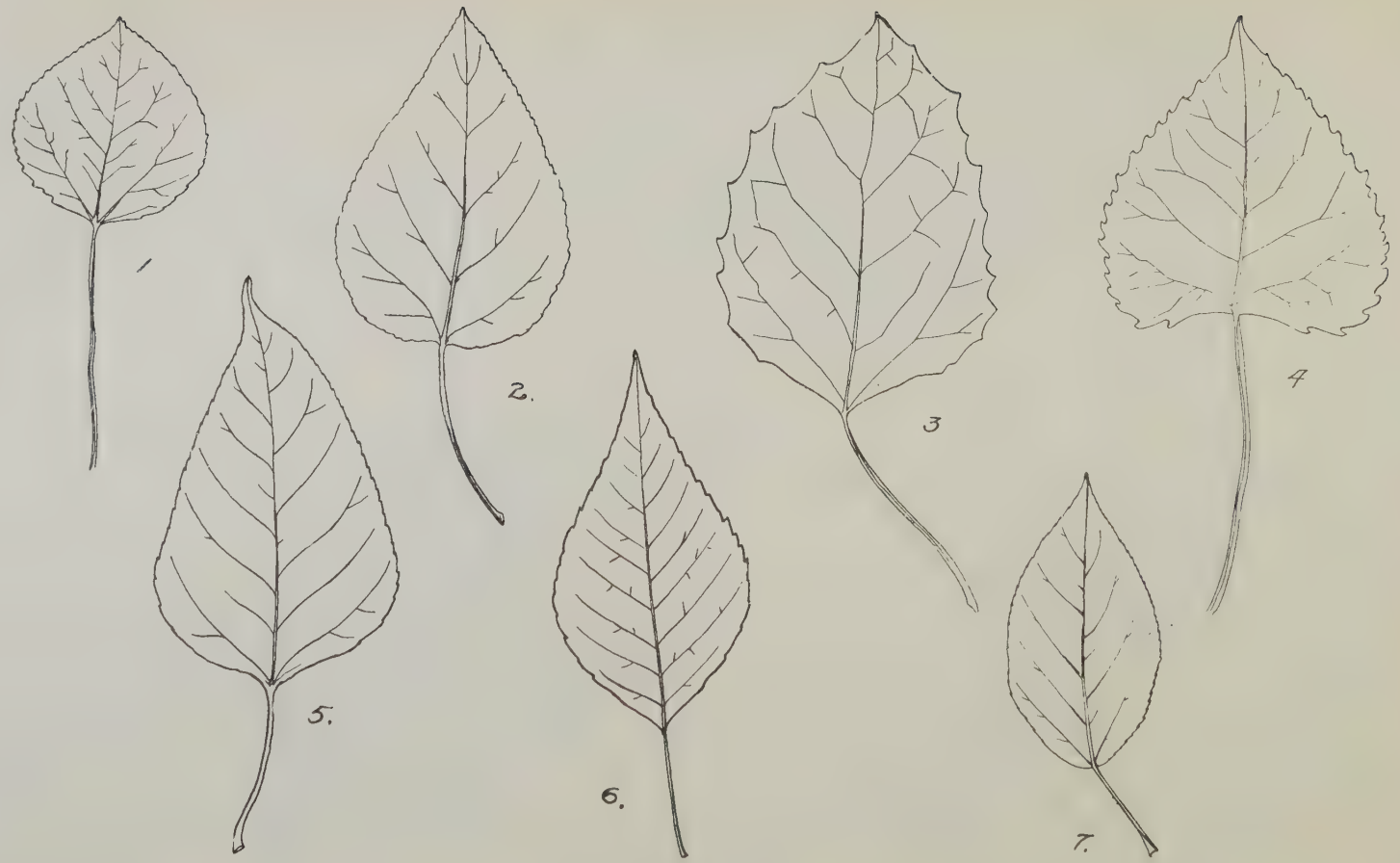
Separation is made mainly by floral characteristics which can be examined for only a short time in the spring, but even then their determination is often a matter of great difficulty and requires considerable experience.

The species differ very widely in size and habit of growth. The majority of the indigenous species never reach tree size but grow as shrubs in thickets,



Willow Leaves

1 Glaucous willow (*Salix discolor*). 2 Black willow (*Salix nigra*). 3 Almondleaf willow (*Salix amygdaloides*).



POPLAR LEAVES

1 Aspen (*Populus tremuloides*). 2 Balsam poplar (*Populus balsamifera*). 3 Large-toothed aspen (*Populus grandidentata*). 4 Cottonwood (*Populus deltoides*). 5 Black cottonwood (*Populus trichocarpa*). 6 Lanceleaf cottonwood (*Populus acuminata*). 7 Narrow-leaf cottonwood (*Populus angustifolia*).

sometimes only a few inches high. They occur, for the most part, along the borders of rivers and streams, but frequently occupy large areas of comparatively dry land.

The willows can be readily recognized from the other trees by their bitter bark and their winter buds, which are covered by single scales. In most species these winter buds are long, narrow, and pointed, and sometimes slightly curved, and have the appearance of being pressed against the side of the twig.

The wood of the different species is similar. It is light and soft but possesses considerable toughness and shock resistance for its weight. It is perishable when exposed to conditions favouring decay. In Canada the wood is used for artificial limbs, cricket bats, and slack cooperage.

For illustration of the twigs and winter buds of some species of this genus, see the first of the plates "Miscellaneous Twigs" at the end of this volume.

THE POPLARS

The poplars (*Populus*), various species of which genus are called also aspens and cottonwoods, are widely distributed throughout the northern portion of both the eastern and the western hemispheres. There are some twenty-five or twenty-six species known, of which eight are native to Canada. Many exotic species, such as the familiar silver poplar (*Populus alba*), distinguished by a dense, white, persistent down on the under surface of the leaf, and the tall, erect Lombardy poplar (*Populus nigra* var. *italica*), have been introduced and are growing all through the older settled portion of Eastern Canada.

The poplars are related to the willows and resemble them in their habit and in their method of reproduction. Even the leaves of some species resemble those of the willow. They are readily distinguished from these trees, however, by their winter buds. The buds of the poplars have many scales and those of the willows have but one.

The seed is very minute, light, and tufted, and is easily carried long distances by the winds. This, together with its abundance, probably accounts for the wide-spread distribution of the poplars.

Many of the species propagate by means of suckers that spring from the roots, and most of them sprout readily from the stump when cut. The artificial reproduction of these trees is done chiefly by planting cuttings.

Populus tremuloides Michx. **Aspen**

Other common names: Poplar, asp, trembling aspen, quaking asp, aspen poplar, white poplar, popple, smooth-barked poplar.

French names: Tremble, peuplier faux-tremble, peuplier tremble, peuplier d'Athènes, bois blanc*, peuplier.

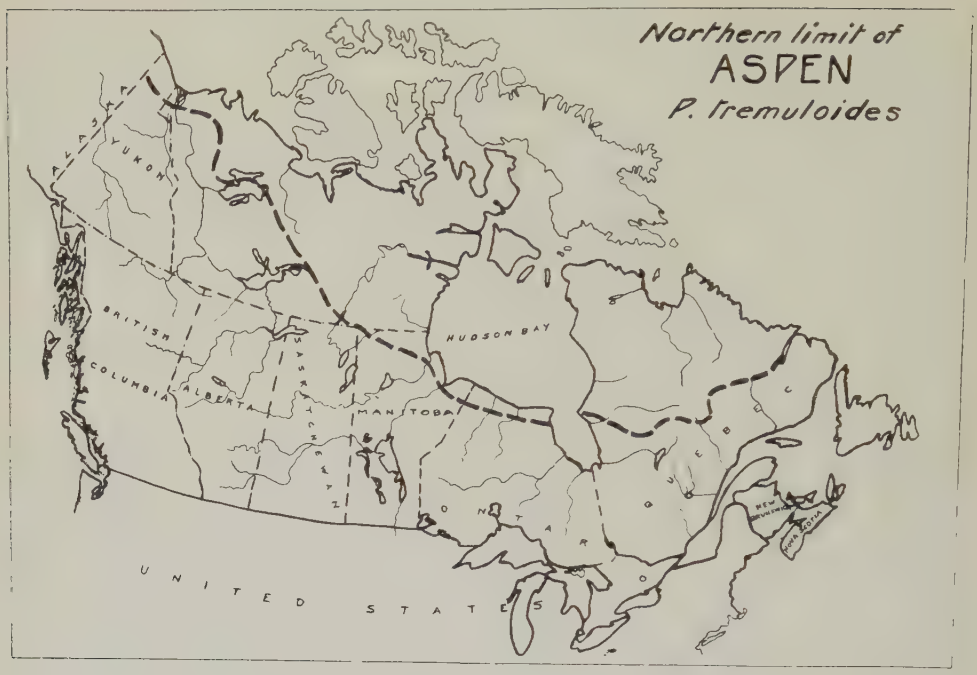
The aspen is a tree of very wide distribution, extending completely across Canada from Labrador and Hudson bay to the mouth of the Mackenzie river and Alaska.

It is not a very large tree, averaging about 40 ft. in height and 8 to 10 in. in diameter, but sometimes reaching a height of 90 ft. and a diameter of 24 in. The trunk is slender, and the crown round-topped and open.

The bark is rough, with flat ridges and deep furrows, becoming paler on limbs.

The twigs are slender, reddish, and smooth, and the winter buds small, shiny, and slightly sticky.

The leaves are $1\frac{1}{2}$ to $2\frac{1}{2}$ in. long and in outline are almost circular. The apex is pointed, and the base often slightly heart-shaped. The margin is finely toothed.


Northern limit of
ASPEN
P. tremuloides
YUKON
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
HUDSON BAY
ONTARIO
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA
UNITED STATES

LARGE-TOOTHED ASPEN
P. grandidentata
HUDSON BAY
MANITOBA
SASKATCHEWAN
ONTARIO
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA

The upper surface is dark green, and the lower surface slightly paler. The leaf-stem is much flattened sideways in a plane opposite to that of the leaf surface, making the leaves very unstable and causing them to tremble in the slightest breeze.

It is a very prolific seeder, shedding seed early in the summer. The seed is very minute and light, and is attached to a downy tuft which causes it to be carried long distances by the wind. For this reason it is often the first tree to come in on a burned area.

It grows best on well-drained loam, but is found on a large variety of soils. It occurs most frequently in pure stands or mixed with other light-seeded species, such as the balsam poplar, large-toothed aspen, or the birches. The growth is rapid but not persistent. It is much subject to certain forms of fungus disease and is not a long-lived tree.

The aspen and the large-toothed aspen are very similar in general habit, but the two trees can be readily distinguished by their buds in winter and their leaves in summer.

As this tree is found in Canada over large areas where other timber is scarce, it is often cut into lumber and used merely because it can be easily obtained; on this account it is a valuable firewood in the Prairie Provinces.

It is perishable when exposed to conditions that promote decay. Aspen is often preferred to other woods for the making of excelsior, because of its light colour. It is suitable for box and crating material and is extensively used for pulp in book and writing papers. Another use is the manufacture of veneers for containers and matches.

Populus grandidentata Michx. **Large-toothed Aspen**

Other common names: Big-toothed poplar, poplar.
French names: Grand tremble, peuplier à grandes dents.

In Canada the large-toothed aspen is found from Nova Scotia and New Brunswick westward, throughout Quebec and Ontario, south of the height of land dividing the watersheds of the Great Lakes and Hudson bay.

The large-toothed aspen is a medium-sized tree 40 to 50 ft. in height and 1 to 2 ft. in diameter. The top is narrow, round-topped, and very open.

The bark on young trees is smooth and greenish-grey, on older trees it becomes cracked. It resembles that of the aspen, except that on old trees it is not so deeply furrowed.

The twigs are stout, reddish-brown, and, at first, more or less downy. The winter buds are shorter than those of the aspen and, on the whole, stand out more from the twig. They are dull, and not sticky, and the margin of the scale is grey and downy.

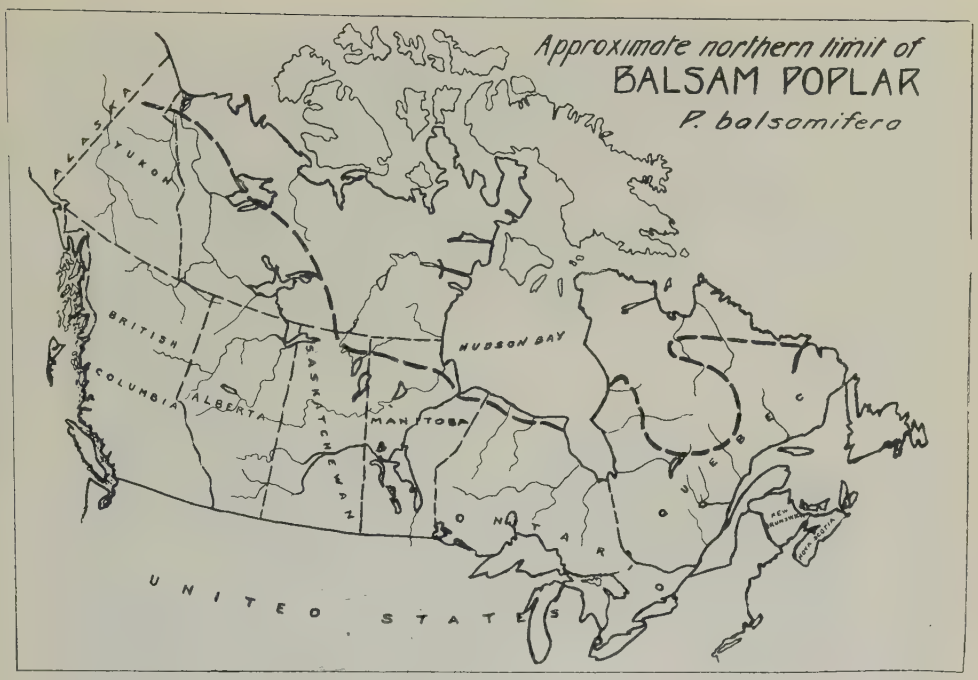
The leaves are coarse and thick, and their margins are coarsely notched with rounded teeth. They are 3 to 4 in. long—larger than those of the aspen.

The tree grows on the same soils as the aspen, but seems to prefer moist, sandy slopes or borders of streams. It is found in pure stands or mixed with aspen, balsam poplar, and birch. Like the aspen it is a good seeder and comes in quickly on burned areas where a few mature trees have escaped the flames.

The wood is similar to that of aspen and is suitable for similar uses.

Poplar Twigs

1 Balsam poplar (*Populus balsamifera*). 2 Cottonwood (*Populus deltoides*). 3 Black cottonwood (*Populus trichocarpa*). 4 Aspen (*Populus tremuloides*). 5 Large-toothed aspen (*Populus grandidentata*). 6 Narrow-leaf cottonwood (*Populus augustifolia*). 7 Lance-leaf cottonwood (*Populus acuminata*).



Populus balsamifera Duroi[1] — **Balsam Poplar**

Other common names: Balm, balm poplar, black poplar, balm of Gilead*, rough-barked poplar, poplar, tacamahac (Quebec and Maritime Provinces).

French names: Peuplier baumier, baumier.

The balsam poplar is distributed from Labrador to the mouth of the Mackenzie river.

It is a medium-sized tree 50 to 60 ft. in height and 1 to 2 ft. in diameter. In the Peace River country of Alberta it sometimes reaches the height of 100 ft. The top is narrow and open.

The bark is brown or grey, and roughened by dark excrescences. It is rougher than that of the aspen.

The twigs are warty and much coarser than those of the aspen. The buds are large and sealed with a fragrant, sticky gum.

The leaves are 3 to 5 in. long and more oval or egg-shaped than those of either of the aspens. The margin is finely toothed and the base rounded. The leaf-stem is round in cross-section, or only the lower half is flattened.

In summer it is easily distinguished from the other poplars of Eastern Canada by its leaves. No other poplar has leaves of such an oval outline. The teeth on the margin are also much finer than those of either of the aspens.

It grows on rich, moist sites such as banks of rivers and bottom lands, and is found in small groups or mixed with willows, alders, and spruce.

The wood is similar to that of aspen and is used for the same purposes.

The balm of Gilead (*Populus candicans*) is considered by many a variety of the balsam poplar. It can be distinguished from the latter tree by the more heart-shaped base of its leaves.

[1]Given as *Populus tacamahaca* by some authors.

Photo. 10726. *B. R. Morton.*

Cottonwood (*Populus deltoides*)

Photo. 1334. *A. Knechtel.*

Black cottonwood (*Populus trichocarpa*)

Populus acuminata Ryd. **Lanceleaf Cottonwood**

French name: Peuplier à feuilles acuminées.

The lanceleaf cottonwood is a medium-sized tree 35 to 40 ft. high and 1 to 1½ ft. in diameter, with a rounded or pyramidal crown formed by stout, spreading branches.

It is not abundant in Canada, being confined in its distribution to the banks of streams in southern Alberta, and is of no commercial value. In habit and distribution it is like the narrow-leaf cottonwood and is often mistaken for that tree.

The bark on young trees is smooth and nearly white, on old trunks it is greyish-brown and deeply cut into broad, flat ridges.

The twigs are slightly four-angled in cross-section and roughened by projecting leaf-scars. Their greenish-brown colour distinguishes them from the orange-brown twigs of the narrow-leaf cottonwood.

The winter buds are longer, more curved, and more resinous, and the points are more drawn out than those of the narrow-leaf cottonwood.

The leaves are 2 to 4 in. long and ¾ to 2 in. wide, and more coarsely notched than those of the narrow-leaf cottonwood. The base is tapered and the tip long drawn out. They are dark green and shiny above and have a slender, yellow midrib.

Populus deltoides[1] Marsh. **Cottonwood**

Other common names: Common cottonwood, Eastern cottonwood.
French names: Liard, cotonnier, peuplier monalifère.

The cottonwood is one of the largest of the poplars, averaging 75 to 100 ft. in height and 2 to 4 ft. in diameter.

The crown is conical and fairly dense on young trees, but spreads out and opens up as they become older.

On old trees the bark is dark grey and more broken than on most poplars.

The tree can be distinguished from the other poplars in winter by the yellowishness of the twigs and by the divergent buds. Ridges run down both sides of the twig from the bases of the leaf-scars. Young sprouts, also, are often angled.

The winter buds are glossy and resinous, but have less resin than most of the poplars. They are ½ in. long, somewhat flattened, and chestnut-brown in colour.

The leaves are a good distinguishing feature in summer. They are triangular in outline and coarsely toothed. The base is square and the apex long and pointed. The length and width are about the same. The stems are compressed sideways.

The cottonwood grows very rapidly and is fairly hardy, and for that reason is used considerably by the farmers in western Canada for planting in shelterbelts and for fuel.

The tree produces seed abundantly but unless conditions are very favourable the seed does not germinate. It is most conveniently reproduced by cuttings or sprouts.

In Eastern Canada this tree is found scattered from Quebec westward throughout southern Ontario, but is nowhere abundant. In Western Canada it is found in the southern part of the three Prairie Provinces. It is a tree that requires considerable moisture and is, therefore, mostly confined to the banks of streams and bottoms of river valleys.

Cottonwood lumber is more valuable than that of the poplars previously mentioned on account of its larger dimensions. It is not common in Canada.

[1] Given also as *Populus balsamifera* L., *P. Sargentii* Dode., and *P. monilifera* Ait. by various authors.

POPLARS, ASPENS, AND COTTONWOODS (*Populus*)

	ASPEN (*P. tremuloides*)	LARGE-TOOTHED ASPEN (*P. grandidentata*)	BALSAM POPLAR (*P. balsamifera*)	COTTONWOOD (*P. deltoides*)	BLACK COTTONWOOD (*P. trichocarpa*)	LANCELEAF COTTONWOOD (*P. acuminata*)	NARROWLEAF COTTONWOOD (*P. angustifolia*)
BARK	Blotched with dark brown patches under the base of the branches. Lighter in colour than that of the large-toothed aspen. See balsam poplar.	Old trees not so deeply furrowed as the aspen.	Rougher than the aspen.	More roughened than most poplars.	Ridges very thick.	Ridges have a flat, smooth top.	Smooth with shallow cracks near the base.
TWIGS	Slender, reddish and not downy. See balsam poplar.	Stout, reddish-brown and sometimes downy.	Much coarser than those of aspen.	Yellowish and not downy. Slightly ridged down both sides from the bases of the leaf-scar.	Slightly angled at first but later round in cross-section.	Light greenish-brown, slightly four-angled in cross-section, and older ones much roughened by leaf-scars.	Orange-brown in colour.
WINTER BUDS	¼ in. long, shiny and without down. Point somewhat curved. Slightly sticky but not fragrant. See large-toothed aspen and balsam poplar.	Dull and with grey down on margin of the scales Shorter and stand out from the twig more than those of the aspen. Not sticky.	Resemble those of the aspen but are larger, fragrant, and more sticky.	½ in. long, glossy, sticky, and somewhat flattened.	¾ in. long, reddish-yellow, and slightly resinous. Bent near the middle	⅓ in. long and more curved than those of the narrowleaf cottonwood.	½ in. long. Longer-pointed and less resinous as a rule than the lanceleaf cottonwood.
LEAVES	Finely toothed. Base often slightly heart-shaped. Stems much flattened sideways. Dark green on both sides.	Larger, with coarser teeth and base squarer than those of the aspen. Stems flattened sideways.	More egg-shaped in outline than either of the aspens. Finely toothed and rounded base. Lower half of the stem flattened sideways. See black cottonwood	Triangular in outline, base square, coarsely toothed.	Very much like that of balsam poplar in outline but it is paler beneath, more leathery in texture, and has a rounder stem in cross-section.	Long and narrow. The tip is more drawn out than with the narrowleaf cottonwood. The midrib is slender. Base tapered and only slightly notched	Narrower than the lanceleaf cottonwood. Margin is also more finely toothed. The midrib is coarser, the stem shorter, and the base rounder than with the lanceleaf cottonwood.

Photo. 8774. *B. R. Morton.*

Large-toothed aspen (*Populus grandidentata*): trunk and bark

Photo. 8608. *B. R. Morton.*

Cottonwood (*Populus deltoides*): trunk and bark

Populus trichocarpa Torr. & Gray — **Black Cottonwood**

Other common names: Balsam cottonwood, balm cottonwood, Western balm, cottonwood, Western balsam poplar.

French name: Peuplier de l'Ouest.

The black cottonwood is found from southern Alaska southward along the coast of British Columbia, and in some of the larger valleys in the southern interior, where it grows mixed with various conifers such as Sitka spruce and Douglas fir, and occasionally occurs in small, pure groves. It demands a moist soil and is therefore confined mostly to river bottoms. This is the Western counterpart of *P. balsamifera*, for which it is often mistaken.

It is a tree 80 to 125 ft. in height and 3 to 4 ft. in diameter, and is one of our largest and most rapid-growing native broad-leaved trees. It is very intolerant of shade, and when growing with other trees it survives only by virtue of its rapid growth, which enables it to keep ahead of the other species with which it occurs. Grown in a dense stand it produces a long, clear bole with a small, round open crown.

The bark is grey and thick and, on large trees, well marked with deep, regular furrows. The twigs are shiny and yellowish in colour. When young they are slightly angled but later become rounded in cross-section.

The winter buds are $\frac{3}{8}$ to $\frac{3}{4}$ in. long, reddish-yellow, and slightly resinous and fragrant. They are frequently curved or bent near the middle.

The leaves are very much like those of the balsam poplar in outline, but are paler beneath and more leathery in texture. The leaf-stalk is round in cross-section.

Black cottonwood is the largest soft non-coniferous wood in British Columbia, and produces wide, clear, and straight-grained lumber which is used to some

extent for boxes and cooperage. Probably the most extensive use of this wood in British Columbia is for veneer and plywood. It is used to some extent as a pulpwood and also as match stock. The buds of this species are collected for medicinal purposes.

Populus angustifolia James — **Narrow-leaf Cottonwood**

French name: Peuplier à feuilles élancées.

The narrow-leaf cottonwood is a medium-sized tree, 35 to 40 ft. high and 12 to 18 in. in diameter, with a narrow, pyramidal crown. Its wood is seldom used commercially.

Like the lanceleaf cottonwood it is confined to the banks of streams in southern Alberta and Saskatchewan, and is often mistaken for it. These trees can be readily distinguished by their leaves, those of the narrow-leaf cottonwood being 2 to 3 in. long, ½ to 1 in. wide, narrow, tapering, and sharp-pointed. The leaf resembles more the leaf of a broad-leaved willow than that of a poplar. The base is rounder, the notching is finer, and the stem is shorter than that of the lanceleaf cottonwood.

THE WALNUTS

The ten or more known species of walnut (*Juglans*) are widely distributed throughout North and South America, southern Europe, northern Africa, and Asia. Four species are native to North America and two species are found in Eastern Canada. No walnuts occur west of Ontario in Canada.

The wood of the walnuts is very valuable, but of small commercial importance in Canada because of the limited supply. The Circassian walnut wood is yielded by the English or Persian walnut (*Juglans regia*) which also produces the European walnut of commerce.

The walnuts are related to the hickories and resemble them in many points. However, there are many features by which they can be readily separated.

Juglans nigra L. — **Black Walnut**

Other common names: Walnut, American walnut, American black walnut.

French name: Noyer noir (d'Amérique).

The black walnut is a large tree 50 to 90 ft. in height and 2 to 5 ft. in diameter. Growing in the open, it has an immense, rounded crown, the lower branches sometimes drooping almost to the ground. In the dense forest, however, it produces a tall, columnar trunk with a small, narrow, rigid head.

It requires deep, rich, well-drained loam and is found growing singly or mixed with other hardwoods. It occurs naturally in Canada only in southern Ontario, bordering lakes Ontario, Erie, and St. Clair, and is now very scarce. Where protected from cold winds, it has been grown considerably north of its natural limits. It is very tolerant of shade and under good conditions grows rapidly.

The bark is roughened by rounded ridges which intersect each other like those of the white ash. The bark is much darker in colour than that of the butternut, a tree which might be mistaken for it. Young trees of the walnut and butternut are readily distinguished by their twigs and winter buds.

The leaves are compound, fifteen to twenty-three leaflets on a stem, 1 to 2 ft. in length, thin, and bright yellowish-green in colour. The black walnut and

WALNUT AND HICKORY TWIGS

1 Black walnut (*Juglans nigra*). 2 Butternut (*Juglans cinerea*). 3 Shagbark hickory (*Carya ovata*). 4 Bitternut hickory (*Carya cordiformis*). 5 Mockernut hickory (*Carya alba*). 6 Pignut hickory (*Carya glabra*).

Photo. 8580. *B. R. Morton.*

Black walnut (*Juglans nigra*)

the butternut are about the last trees of the Canadian woods to open their leaves in the spring.

The nut is almost round, $1\frac{1}{4}$ to $1\frac{1}{2}$ in. in diameter, and has a hard, black shell which is cut into sharp ridges. The husk is blackish with an aromatic odour. The kernel is oily, sweet, and edible. The nut has a good market value.

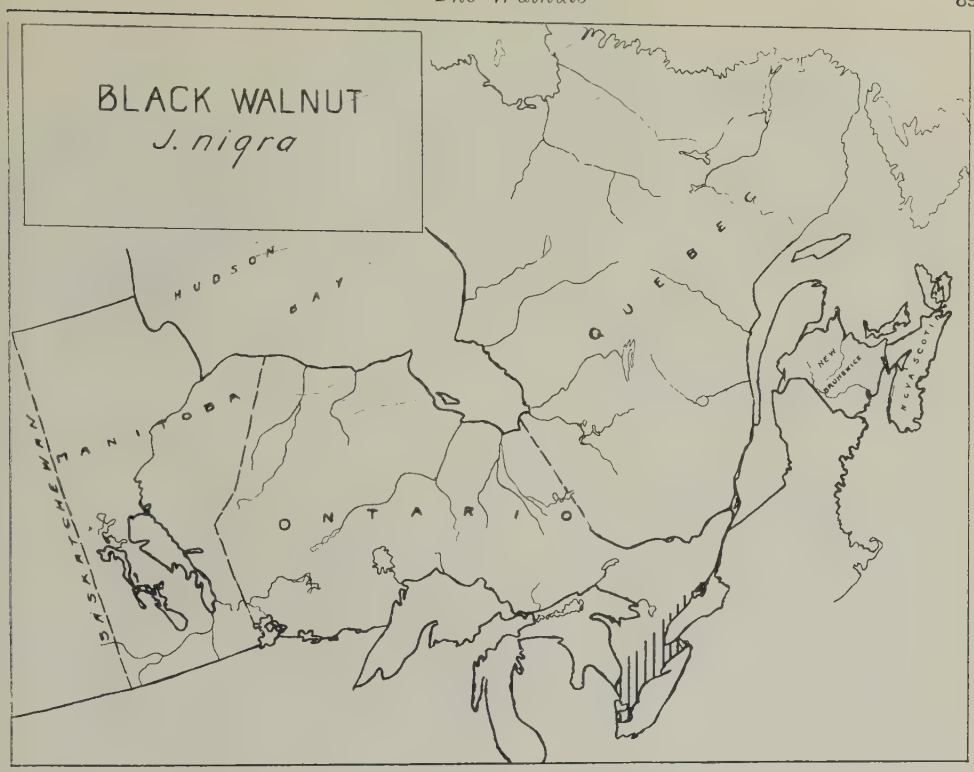
The wood of black walnut has a rich brown colour, is soft and easily worked, and is extensively used in the manufacture of fine furniture, interior finish, and gun stocks.

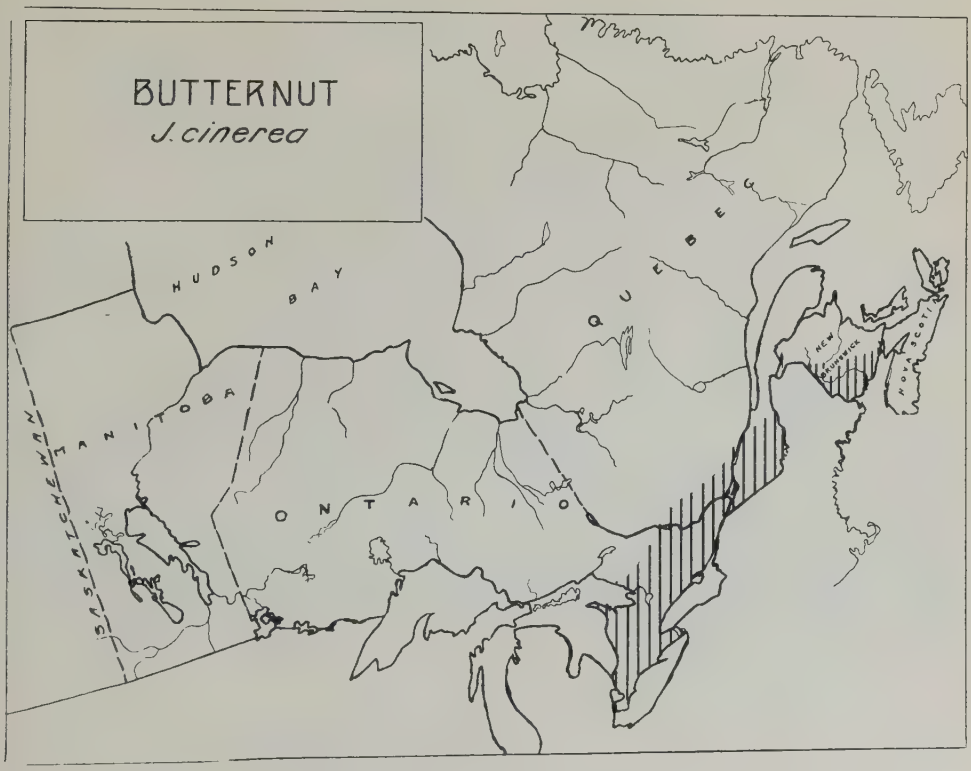
Juglans cinerea L. **Butternut**

Other common name: White walnut.

French names: Noyer cendré, noyer tendre, noyer gris, arbre à noix longues.

In Canada the butternut is found from New Brunswick up the valley of the St. Lawrence and throughout the hardwood region in Ontario, east and south of Georgian bay. It prefers rich, well-drained loam and is found solitary or in small groups associated with other hardwood species.


BLACK WALNUT
J. nigra
HUDSON
BAY
QUEBEC
NEW
BRUNSWICK
NOVA SCOTIA
MANITOBA
SASKATCHEWAN
ONTARIO


BUTTERNUT
J. cinerea
HUDSON
BAY
QUEBEC
NEW
BRUNSWICK
NOVA SCOTIA
MANITOBA
SASKATCHEWAN
ONTARIO

Black walnut (*Juglans nigra*): leaf and fruit

It is a medium-sized tree 40 to 50 ft. in height and 1 to 3 ft. in diameter. The trunk divides into several large branches which spread, forming a crown triangular in outline. The smaller branches dip down and turn up again in a manner characteristic of many of our nut trees.

When young the butternut much resembles the black walnut, but they can readily be separated upon comparing their twigs and winter buds. In older trees the bark and fruit are sufficient to distinguish them.

The bark of the butternut is light grey with broad, smooth-topped ridges, which at a distance appear like whitish, interlacing, vertical stripes. The bark of the black walnut is much rougher and darker.

The leaves are compound, i.e., composed of many leaflets attached to a common stalk. This stalk is 10 to 25 in. long. The leaflets number from nine to seventeen and are of oblong, oval shape, saw-toothed, and pointed.

The twigs are downy and clammy and the pith, like that of the black walnut, is chambered. The winter buds are light brown, longer than broad, and downy.

The nut is oblong, pointed at one end, and 2 to 3 in. long. The shell is deeply furrowed, and has many fine, hard, sharp, irregular ridges. The husk, or outer covering, is brown, very sticky, and will stain the hands if much handled. The kernel is edible.

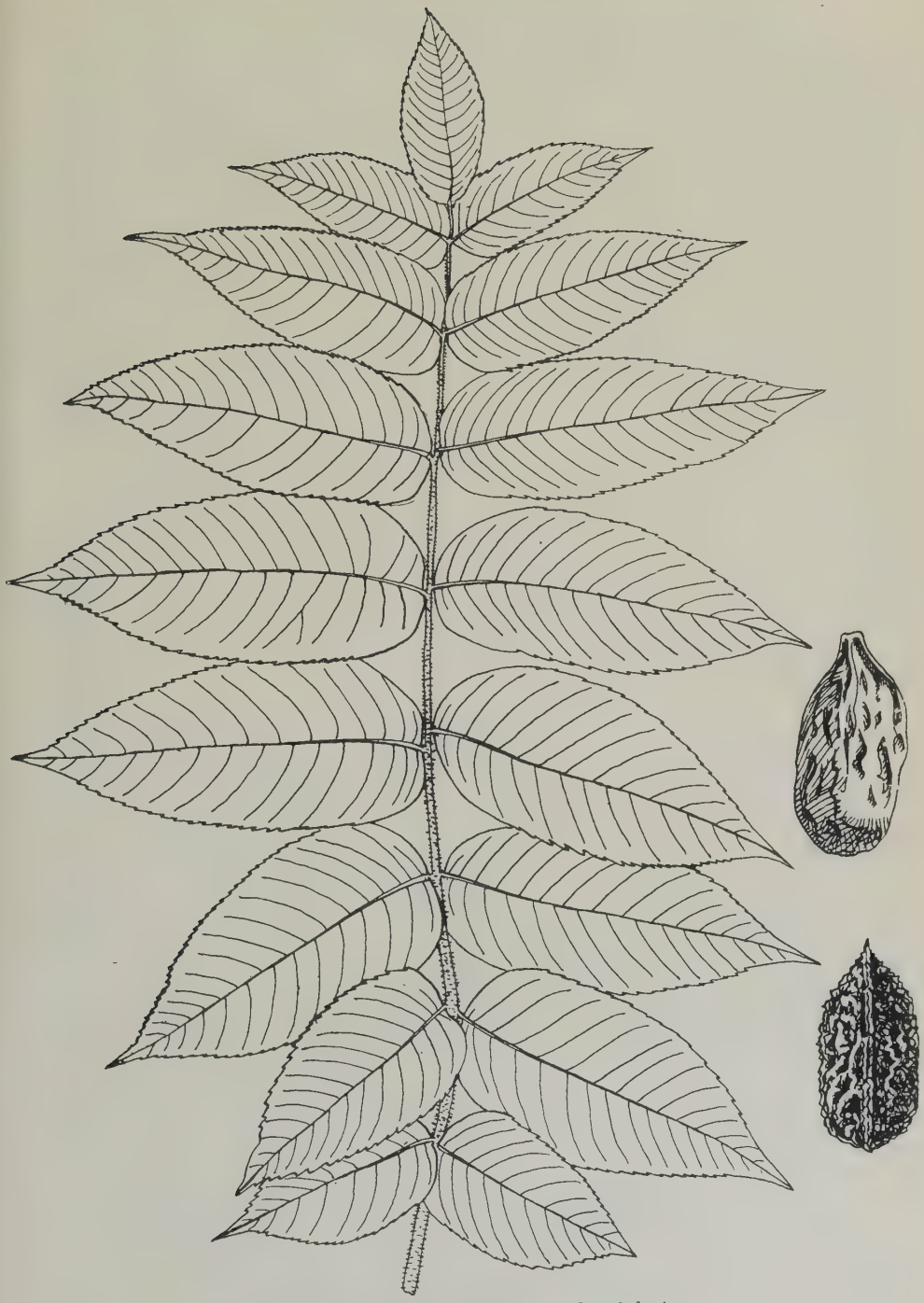
The wood of the butternut is soft and weak, and is lighter in weight and colour than that of the black walnut, otherwise the two woods are similar in grain and texture.

In Canada it is used for boat-building and interior finish. As the occurrence of the tree is comparatively rare, its wood is not common on the market.

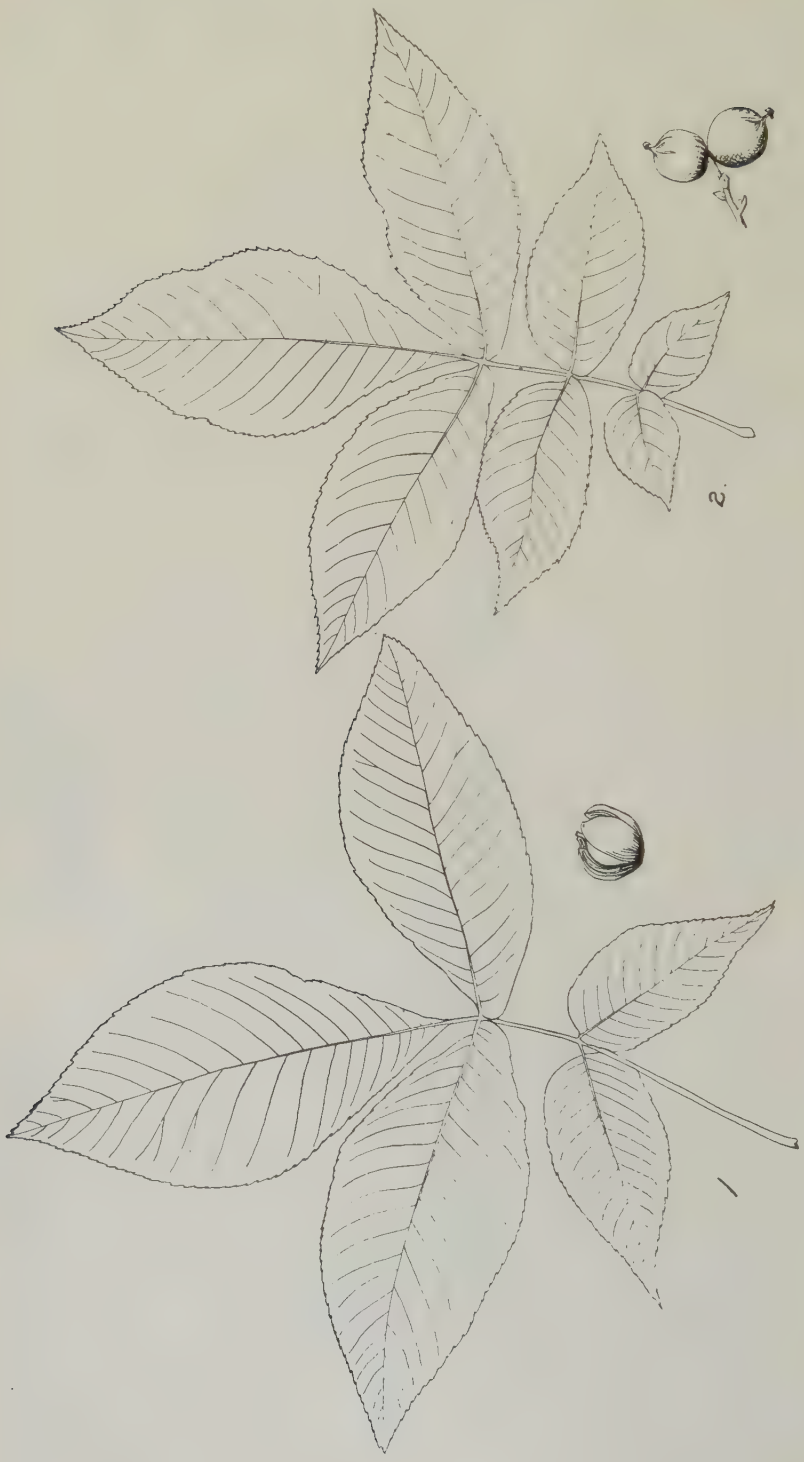
Photo. 11003. *R. H. Campbell.*

Butternut (*Juglans cinerea*)

	WALNUTS (*Juglans*)		HICKORIES (*Carya*)			
	BLACK WALNUT (*Juglans nigra*)	BUTTERNUT (*Juglans cinerea*)	SHAGBARK HICKORY (*Carya ovata*)	BITTERNUT HICKORY (*Carya cordiformis*)	MOCKERNUT HICKORY (*Carya alba*)	PIGNUT HICKORY (*Carya glabra*)
BARK	Rough with rounded ridges. Darker than the butternut.	Light grey with broad smooth-topped ridges which at a distance look like pale, interlaced stripes	Shags off in large plates which are free at both ends.	Shallow fissures and narrow ridges	Close, wavy furrows and has a general appearance of having been sand-papered.	Slightly shaggy on some trees. Somewhat like that of the white ash.
TWIGS	Smoother than butternut in winter and not sticky Leaf-scar is notched at the top but has no fringe of down. Pith chambered and light brown.	Somewhat downy and sticky. Leaf-scar is not notched at the top but has a fringe of down. Pith chambered, dark brown and somewhat five-sided in cross-section.	Coarse. Pith solid. Smooth, sometimes slightly hairy.	Slender. Pith solid.	Very coarse. Pith solid.	Delicate and inclined to droop. Pith solid.
WINTER BUDS	Grey and downy. End bud of twig scarcely longer than broad.	Light brown and very downy. End bud longer than broad. Small buds just over the leaf-scars have the roughened appearance of a pineapple.	Large. Have two dark, projecting, outer scales.	Long, curved, and sulphur-yellow in colour.	Egg-shaped and pointed The largest of any of the hickory buds. No projecting outer scales as with shagbark.	Egg-shaped but smaller than those of any other hickory.
LEAVES	15 to 23 leaflets on one stem. One side of leaflet base often more rounded than the other.	9 to 17 leaflets on a stem. Both sides of the leaflet base usually rounded to the same extent.	5 to 7 leaflets. Margin usually hairy.	7 to 11 leaflets. Smooth on both sides.	7 to 9 leaflets. Rough beneath. Fragrant when crushed.	5 to 9 leaflets, rarely 9 leaflets. Smooth on both sides.
FRUIT	Nut almost round, shell rough. Husk not sticky.	Nut elongated, shell rough. Husk sticky.	Shape varies. Shell smooth but has 4 distinct ridges. Kernel sweet. Husk splits into 4 sections and falls off.	Often broader than long. Shell thin and smooth. Kernel bitter. Husk thin and leathery.	Shell thick, smooth and four-ridged. Kernel small but sweet. Thick husk which splits half-way to the base.	Pear-shaped or round, Shell smooth. Kernel bitter or sweet. Has a leathery husk which stays on the nut after it has fallen from the tree.



Butternut (*Juglans cinerea*): leaf and fruit



Hickory Leaves and Fruit

1 Shagbark hickory (*Carya ovata*). 2 Bitternut hickory (*Carya cordiformis*).

THE HICKORIES

Twelve species of hickory (*Carya*) are recognized and all of them are confined to this continent. Six occur in Canada, none west of Ontario.

They are related to the walnuts and, like them, have compound leaves and produce hard-shelled nuts which are surrounded by an outer shell or husk, but there are many points in which they differ sufficiently to be readily distinguished. The different species of hickory, however, are rather difficult to separate because of intermediate forms being sometimes developed by natural hybridization.

The wood of the different species is so similar in its technical qualities that it is usually sold simply as "hickory". The lumber of the different species is seldom separated on the market. The wood is among the hardest, toughest, and strongest of the timbers of commerce, few woods surpassing it in any of these qualities. It is used in Canada chiefly for vehicle stock, spokes, tool-handles, agricultural implements, machinery parts, and sporting goods.

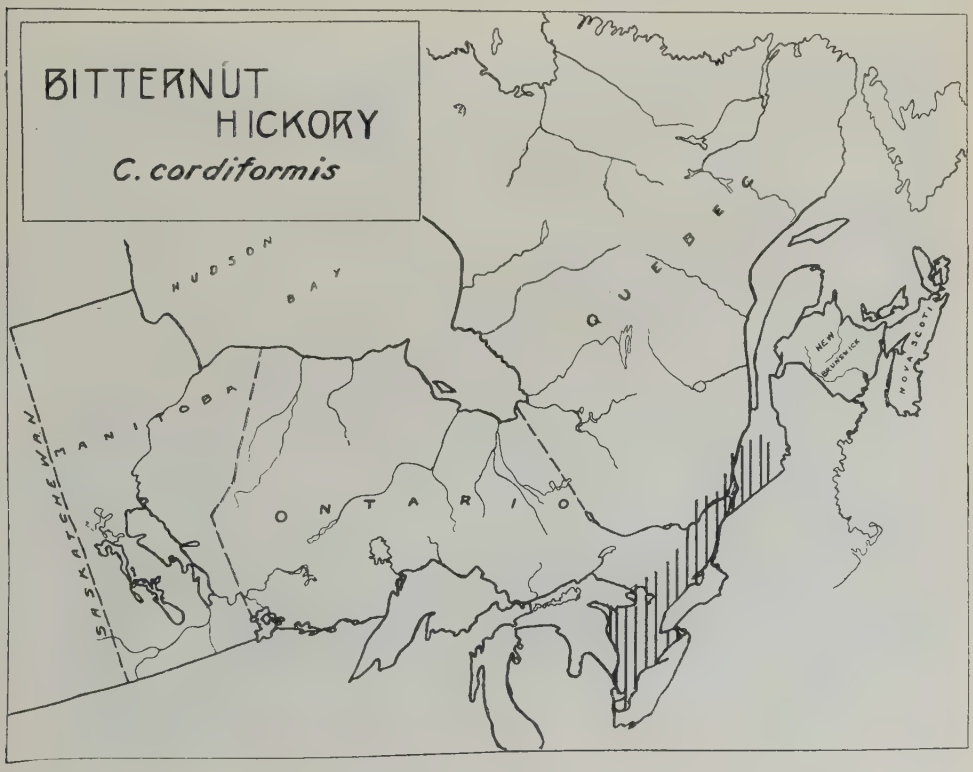
Carya cordiformis (Wang.) K. Koch — **Bitternut Hickory**

Other common name: Swamp hickory.
French names: Carya amer, noyer dur.

The bitternut hickory is a tree 50 to 60 ft. high and 1 to 1½ ft. in diameter. The crown in the open is large and spreading.

The bark is a light granite grey, close-fitting, and roughened by shallow fissures and narrow ridges.

The twigs are slender as compared with the shagbark or mockernut hickories but not quite as delicate as those of the pignut. Recent shoots are an orange-green colour and dotted.



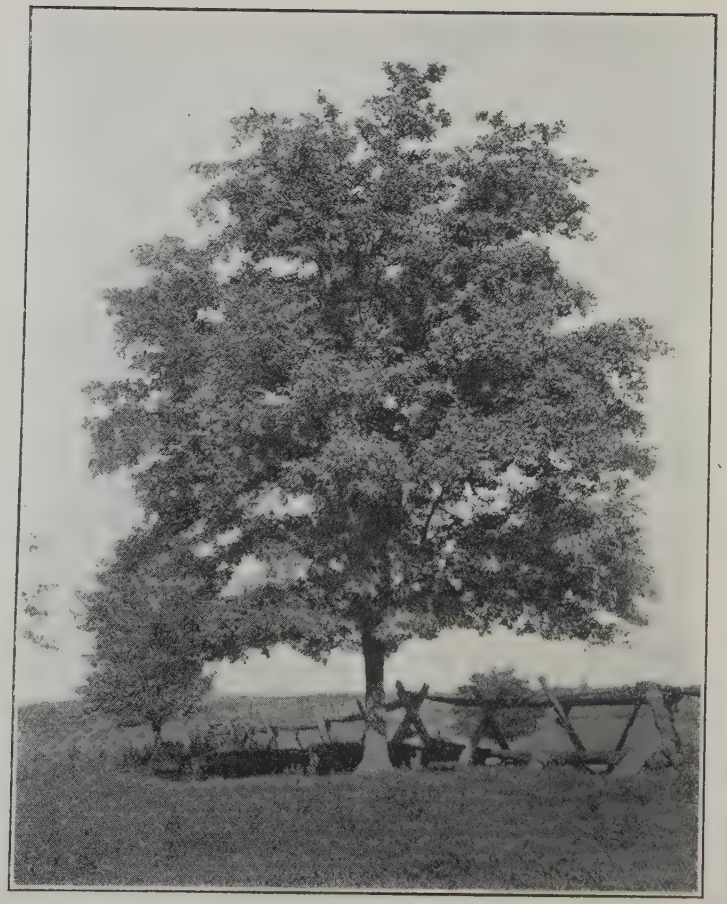


Photo. 11004. *R. H. Campbell.*

Bitternut hickory (*Carya cordiformis*)

Photo. 8614. *B. R. Morton.*

Shagbark hickory (*Carya ovata*)

Photo. 8613. *B. R. Morton.*

Shagbark hickory (***Carya ovata***):
trunk and bark

Photo. 8572. *B. R. Morton.*

Bitternut hickory (***Carya cordiformis***):
trunk and bark

Photo. 8753. *B. R. Morton.*

Butternut (***Juglans cinerea***):
trunk and bark

Photo. 9424. *B. R. Morton.*

Yellow birch (***Betula lutea***):
trunk and bark

Hickory Leaves and Fruit

3 Mockernut hickory (*Carya alba*). 4 Pignut hickory (*Carya glabra*).

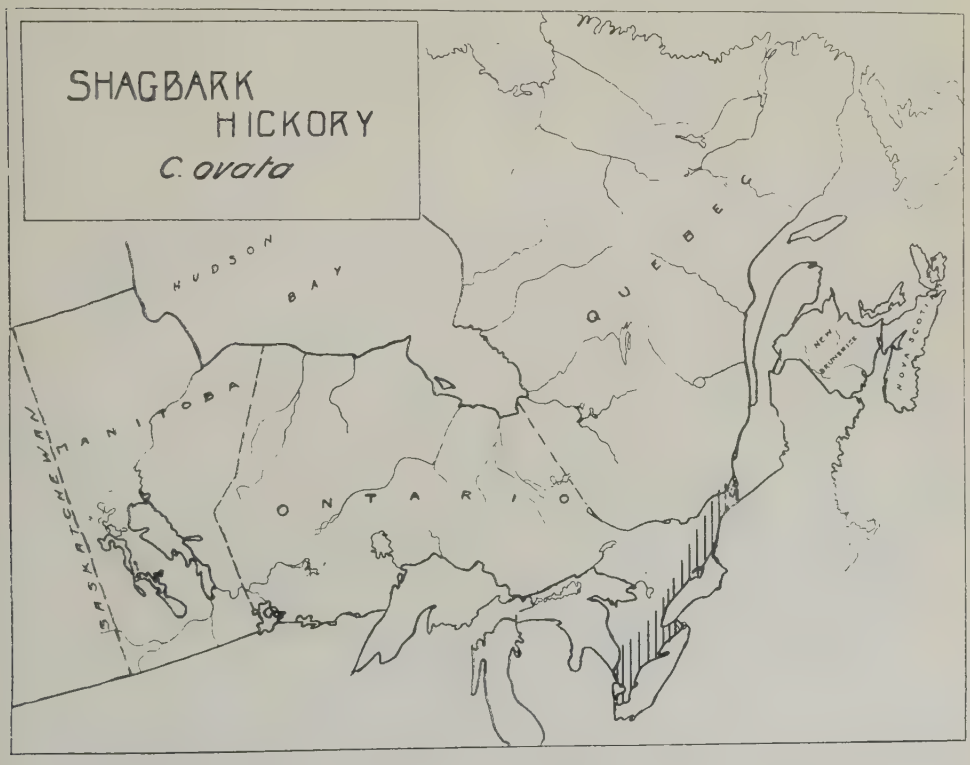
The winter buds are chief points of distinction. While the buds of all other hickories are brown, the bitternut hickory has sulphur-yellow buds. They are long, curved, flattened, and pointed. Buds on the side of a twig are shorter and rounder than those at the end. Usually one or two buds on a stem still remain closed after the others have opened in the spring.

The leaves have from seven to eleven leaflets on one stem. The leaflets are narrower than those of any other hickory. Both upper and lower surfaces are smooth.

The nut is often broader than long and is covered with a thin husk. It has four ridges reaching almost half-way from the point to the base. The shell is very thin; it is the thinnest-shelled hickory. The kernel is very bitter.

The bitternut hickory is found in southern Ontario from Georgian bay eastward and throughout the southwestern part of Quebec. It prefers low, wet situations near streams, but is also found on higher ground in good soil. It is fairly tolerant of shade and grows scattered among other hardwoods. The rate of growth is rapid for a hickory, but, at best, is only medium when compared with other trees.

This is an important Canadian hickory on account of its wide distribution and common occurrence.



Carya ovata (Mill.) K. Koch **Shagbark Hickory**

Other common name: Shellbark hickory.

French names: Carya blanc, noyer écailleux, noyer blanc d'Amérique.

The shagbark hickory reaches a height of 50 to 80 ft. and a diameter of 1 to 2 ft., and is one of the largest hickories. The trunk is straight and columnar, topped with a small, flat crown when grown in a dense stand. In

the open the trunk is shorter and is divided into a few short, heavy, spreading limbs forming a crown which in outline resembles an inverted cone.

The bark is light grey in colour, and flaky. It sloughs off in large plates which are free at both ends. This peculiarity gives it its common name and distinguishes it from the other hickories. The bark of the pignut hickory is slightly shaggy on some trees but not to the same extent as that of the shagbark. The twigs, winter buds, and fruit of these two species are points by which they can be readily separated.

The twigs of the shagbark are coarse, reddish-brown, and shiny, sometimes slightly downy, and greyish.

The buds are yellowish-brown and large, and have two dark, projecting outer scales which are not found on the other hickories.

The leaves have five to seven leaflets on a stem, usually five. The leaflets are 4 to 8 in. long, thin, yellowish-green, and usually have hair on their margins. The leaf-stem is rough.

The shape of the fruit varies, but it is usually compressed laterally and is four-ridged. The husk splits and breaks into four sections. The kernel is sweet and edible, and the nut is of greater commercial value than that of any other native hickory.

The shagbark hickory has a long tap root and requires a deep, fresh, fertile, well-drained soil. It sprouts readily from the stump, endures considerable shade, and is usually found mixed with other hardwoods.

In Canada it is confined to southern Ontario and southwestern Quebec.

Carya alba (L.) K. Koch — **Mockernut Hickory**

Other common names: Whiteheart hickory, bigbud hickory.

French names: Carya tomenteux, noyer dur, noyer à noix douces, noyer blanc.

The mockernut hickory is a tall tree 75 to 90 feet high when growing in the forest. Isolated, it is shorter with a broad, round-topped crown. The lower branches have a tendency to droop more or less.

The bark is grey, smooth, not shaggy, and broken by close, wavy furrows. The tops of the ridges, being a lighter shade of grey than the rest of the bark, give to the trunk a somewhat rubbed or sand-papered appearance.

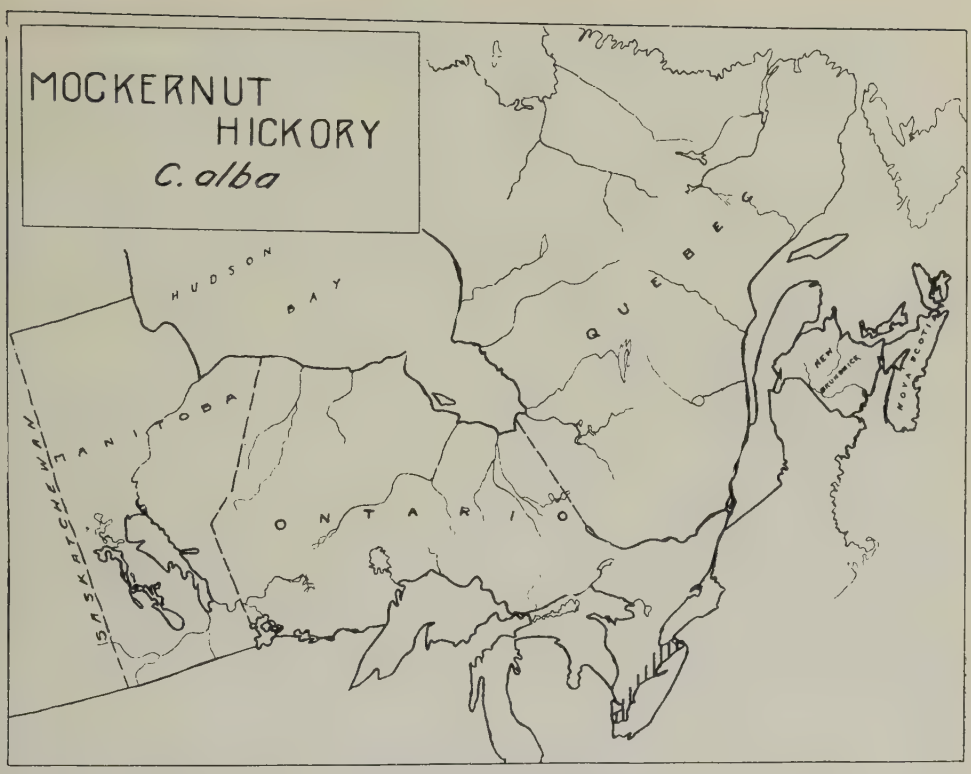
The twigs are very coarse and the winter buds large. The buds are slightly larger than those of the shagbark hickory and can be distinguished from them by their lack of persistent, projecting outer scales. They are hard, round, yellowish-brown, and downy.

The leaves are composed of seven to nine leaflets which are a deep yellowish-green and rough-downy beneath. When crushed they are fragrant.

The nut is large, but the shell is so thick that, when opened, the kernel is disappointing. The name "mockernut" is probably due to this peculiarity. It has the thickest shell of all hickories. The husk is hard and thick, and when the nut is ripe it splits in four directions from the tip half-way to the base. The kernel is sweet but difficult to extract.

The mockernut is found growing on a wide variety of soils but prefers well-drained, rich slopes. In Canada this tree is found in the counties bordering lakes St. Clair, Erie, and Ontario.

The wood of this species is sometimes considered to be superior to that of the other hickories.


MOCKERNUT
HICKORY
C. alba
HUDSON
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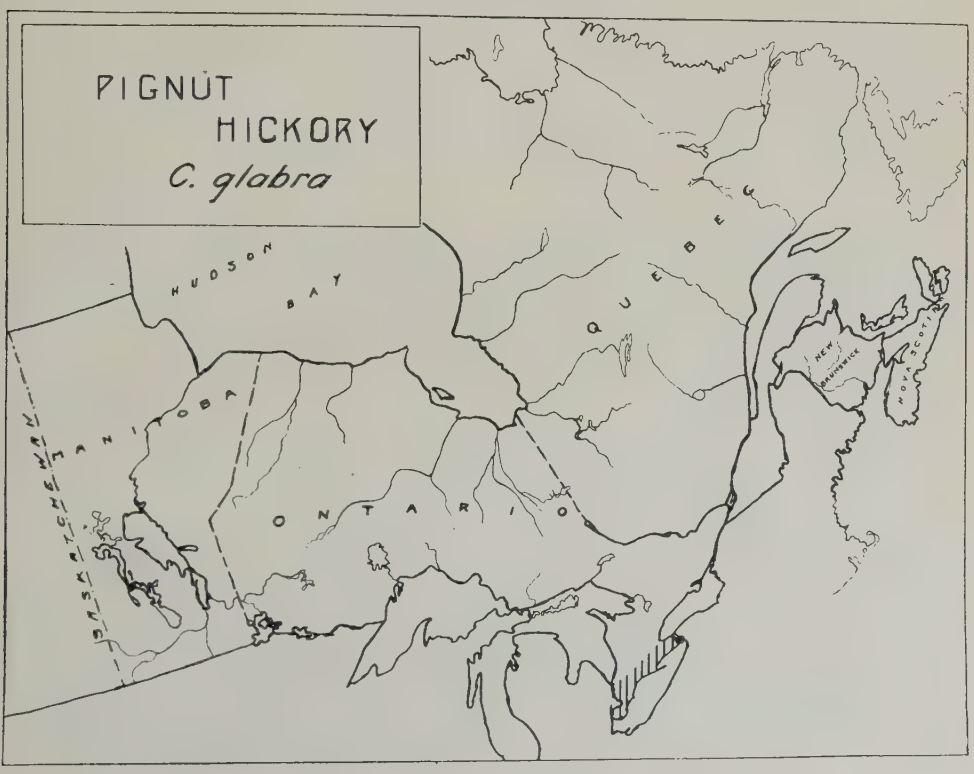
SASKATCHEWAN
MANITOBA
ONTARIO


PIGNUT
HICKORY
C. glabra
HUDSON
BAY
QUEBEC
NEW
BRUNSWICK
NOVA SCOTIA
SASKATCHEWAN
MANITOBA
ONTARIO

Carya glabra (Mill.) Sweet — **Pignut Hickory**

Other common names: Brown hickory, black hickory.

French names: Carya glabre, noyer à noix de cochon, carya des pourceaux.

The pignut hickory is a tree 40 to 60 feet in height and 2 to 3 feet in diameter. When growing in the open, the crown is very narrow and long, extending well down the trunk. The branches are frequently much twisted and contorted, the lower ones hanging towards the ground.

The bark is grey, tight-fitting in appearance, at times not unlike that of the white ash. Frequently it is slightly shaggy.

The twigs are delicate, being finer than those of the other hickories. They are inclined to droop or hang down.

The winter bud is yellowish-brown, round or egg-shaped, and smaller than that of any other hickory.

The leaves are composed of from five to nine leaflets (usually seven and rarely nine). They are a rich yellowish-green in colour and smooth on both sides.

The nuts vary in size. They are usually pear-shaped but some are oval. Others, again, are perfectly round or broader than long. The kernel is bitter or sweet. The husk splits only half-way to the base and, as a rule, falls off the tree with the nut.

It prefers rich, well-drained soils but grows under a variety of conditions. In Canada it is found in the Niagara peninsula and the counties bordering lake Erie.

The little pignut (*Carya microcarpa*) is considered a variety of this tree.

THE BIRCHES

The thirty species of birch (*Betula*) recognized are confined chiefly to the north temperate zone and range in size from very large trees to very small shrubs. Nine species occur in Canada, of which four inhabit the Pacific coast region. Certain species are found at the very limit of tree growth in the north.

The bark of all birches is characteristically marked with long horizontal slits or lenticels, and on young trees of most species it can be separated into papery layers.

The leaves are alternate in their arrangement on the twig, that is, they do not come out in pairs from the opposite sides of the twig, although on twigs one year old they are often produced in pairs on each side of a bud.

The birches are related to the alders, and, like them, produce their seed in small, scaly cone-like catkins. These cone-like catkins in the case of the birches fall to pieces when ripe, while those of the alders remain intact.

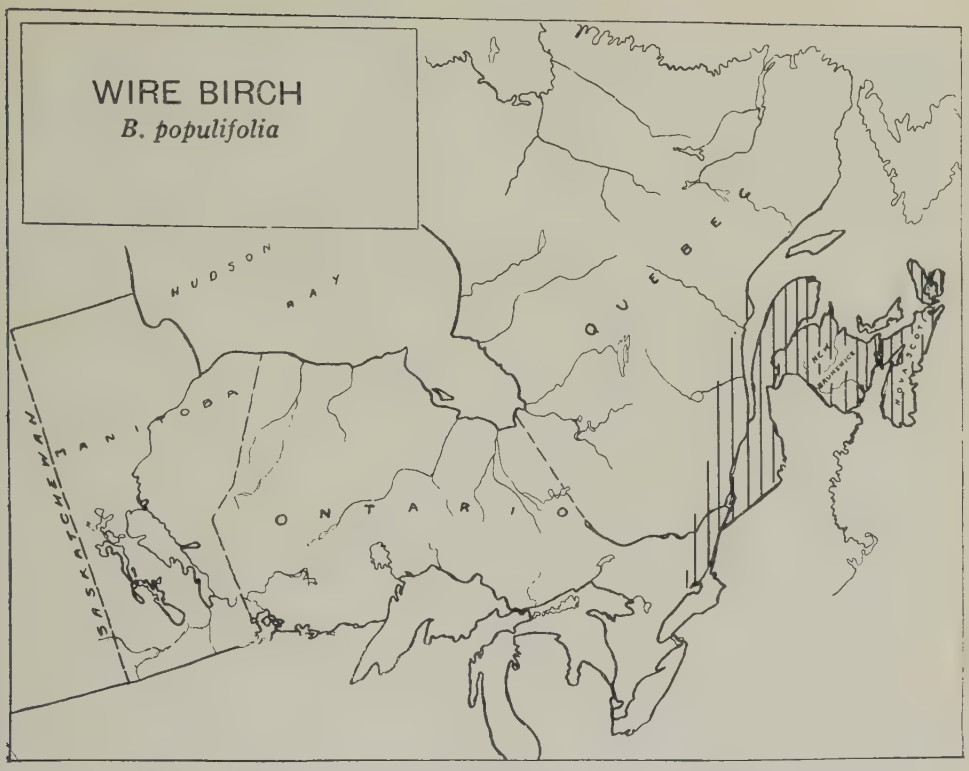
Betula populifolia Marsh. — **Wire Birch**

Other common names: White birch, grey birch, poplar-leaved birch.

French names: Bouleau gris, bouleau à feuilles de peuplier, bouleau rouge*.

The wire birch ranges from the Maritime Provinces westward through the St. Lawrence river valley to eastern Ontario. It is found growing on dry, gravelly soils and is often one of the first trees to spring up after a forest fire. Occasionally it is found in wet ground along the margin of streams and swamps.

It is a small tree, rarely over 30 or 35 feet in height. The trunk usually extends undivided to the top of the tree. The branches are slender and divide into many long, fine, flexible branchlets that have a tendency to droop. The ends of the twigs are rough to the touch.



The bark on the trunk and larger branches is thin and white, but it does not split readily into papery layers as does that of the white birch. On the trunk beneath each limb is a triangular black spot that is characteristic of this tree. The bark at the base of the trunk on the larger trees is frequently broken by irregular fissures.

The winter buds are slender, brown, about $\frac{1}{4}$ inch long, pointed, and waxy. Those of the canoe birch, for which this tree might be mistaken, are larger and somewhat sticky.

The leaves are $2\frac{1}{2}$ to 3 inches long, triangular in outline, with a long, tapering point. The margin is double-toothed and the upper surface is bright green and shiny. The stems are smooth and long, longer than those of the white or canoe birch, and the leaves are therefore agitated by the slightest breeze and flutter as freely as those of the aspen.

As this tree rarely reaches commercial size in Canada its wood is seldom used, except locally for firewood and barrel hoops.

Betula papyrifera Marsh. **White Birch**

Other common names: Paper birch, canoe birch, silver birch.
French names: Bouleau blanc, bouleau à papier, bouleau à canot.

The white, or canoe, birch has an extremely wide range in Canada, being found from Labrador and the Maritime Provinces westward to Yukon territory and to the north Pacific coast. Along with tamarack, white spruce, black spruce, balsam poplar, and aspen, it reaches its northern limit near the mouth of the Mackenzie river.

It is a tree rarely over 70 feet in height or with a diameter over 18 inches. Ordinarily it is about 50 feet high and 8 to 10 inches in diameter. In the forest the trunk is long and clear, but in the open it is short, and the crown is large, irregular, and composed of many upright branches.

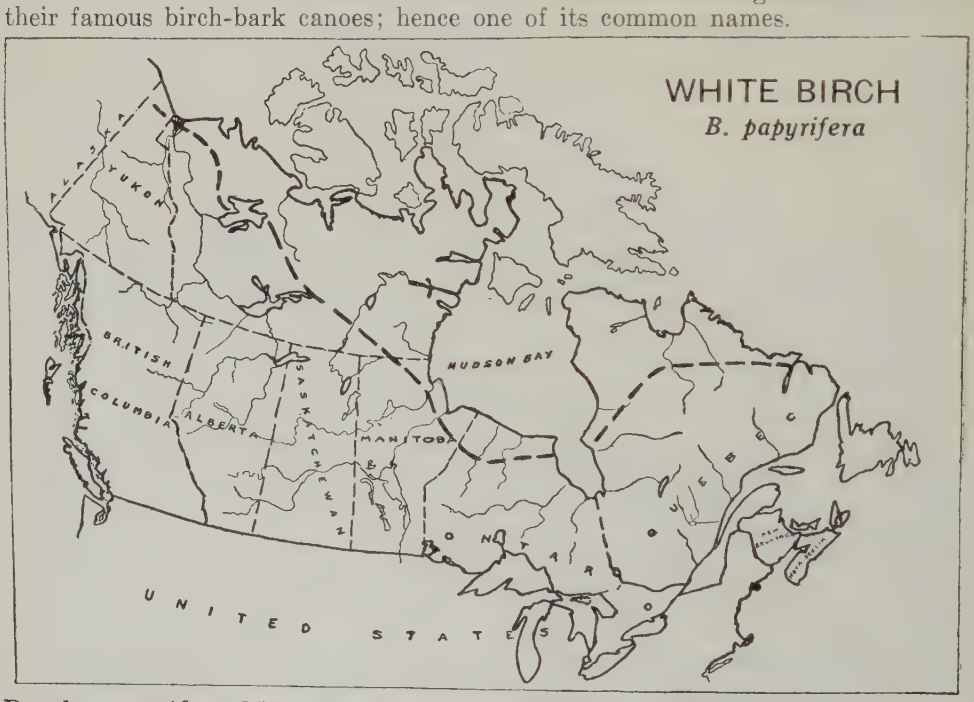
The white, tough, easily split, thin, papery bark of the trunk and larger limbs is too well-known to need further description. The wire birch is the only other tree the bark of which is likely to be mistaken for that of this tree; and the wire birch can be distinguished from it by the fact that its bark is usually of a dirty white colour, with a chalky surface, and will not separate into thin sheets as readily as that of the white birch.

The branches are stouter than those of other birches, and they do not tend to droop as do those of the wire birch. The twigs are also smoother and coarser than those of the wire birch, and they are somewhat sticky near the point of attachment of the winter bud. The winter buds themselves are sticky and larger than those of the other birches.

The leaves are good features by which to distinguish most birches, since they differ considerably in many points. Those of the paper birch are 2 to 3 inches long, and oval in general outline. The teeth are coarse and irregular. The upper surface is dull green and smooth, and the stems are short and downy.

The wood is not so heavy and strong as that of yellow birch, but when of sufficient size is sometimes used for similar purposes. It is valuable for the manufacture of spools, dowels, bobbins, clothes-pins, shoe-pegs, shanks, small woodenware, and veneer.

It is from the bark of this tree that the Indians have for generations made their famous birch-bark canoes; hence one of its common names.

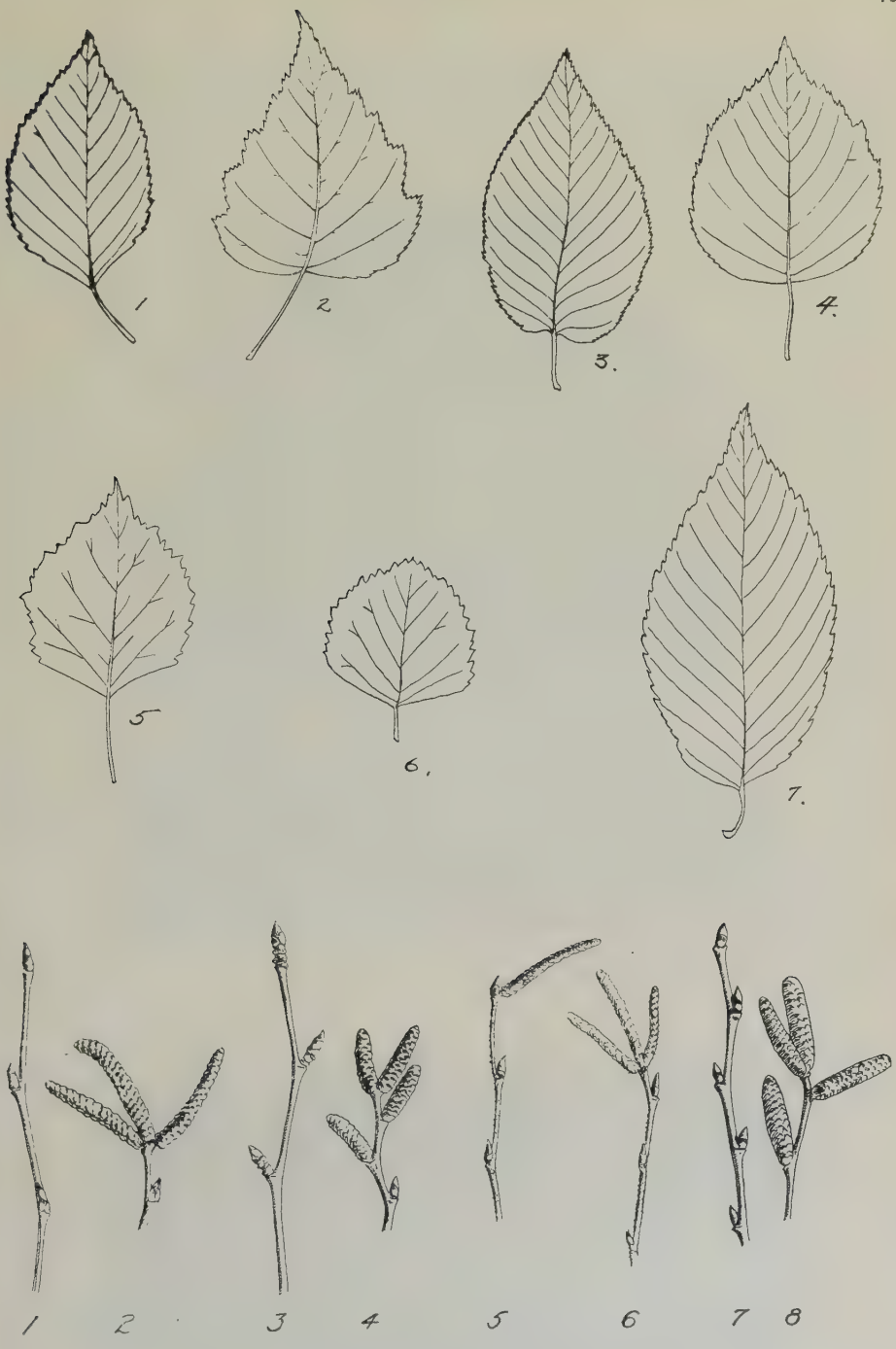


Betula papyrifera Marsh. var. **occidentalis** Sarg. **Western White Birch**

Other common names: Western birch, British Columbia birch, black birch.

French name: Bouleau occidental.

The range of the Western white birch in Canada is imperfectly defined, but it is probably confined to southwestern British Columbia, mainly to the Fraser river valley. It is the western counterpart of white birch. It is sawn into lumber and used for interior finish in British Columbia. In some places it grows to be quite a large tree, 2 to 3 feet in diameter, but often it does not attain a larger size than 8 to 10 inches, the height varying from 20 to 80 feet or over.



BIRCH LEAVES AND TWIGS

LEAVES.—1 White birch (*Betula papyrifera*). 2 Wire birch (*Betula populifolia*). 3 Sweet birch (*Betula lenta*). 4 Western white birch (*Betula papyrifera* var. *occidentalis*). 5 Alaska birch (*Betula alaskana*). 6 Mountain birch (*Betula fontinalis*). 7 Yellow birch (*Betula lutea*).

TWIGS.—1 and 2 White birch (*Betula papyrifera*). 3 and 4 Sweet birch (*Betula lenta*). 5 Wire birch (*Betula populifolia*). 6 Western white birch (*Betula papyrifera* var. *occidentalis*). 7 and 8 Yellow birch (*Betula lutea*).

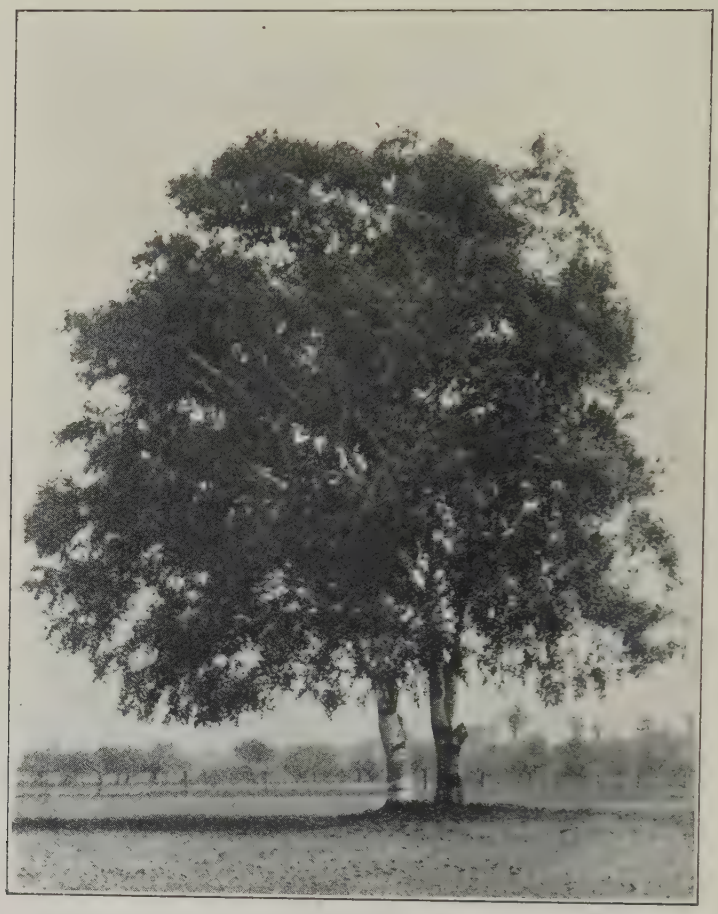


Photo. 8575. B. R. Morton.
White birch (*Betula papyrifera*)

Photo. 5711. B. R. Morton.
White birch (***Betula papyrifera***): trunks and bark

The bark of the young trunk is brown, smooth, and shiny, and can be separated into thin layers. In large trees the main trunk has creamy white bark, closely resembling that of white birch.

The leaves are 2½ to 3 inches long, dull deep-green, and broadly oval in outline. The base at times is almost a straight line, which gives the leaf a triangular outline. Those of the Alaska and mountain birches, the other two Pacific coast birches, are smaller.

Betula lutea Michx. **Yellow Birch**

Other common names: Tall birch, curly birch, gold birch (Nova Scotia), red birch*, hard birch, black birch*.

French names: Merisier, bouleau jaune, merisier jaune, merisier ondé, merisier rouge*.

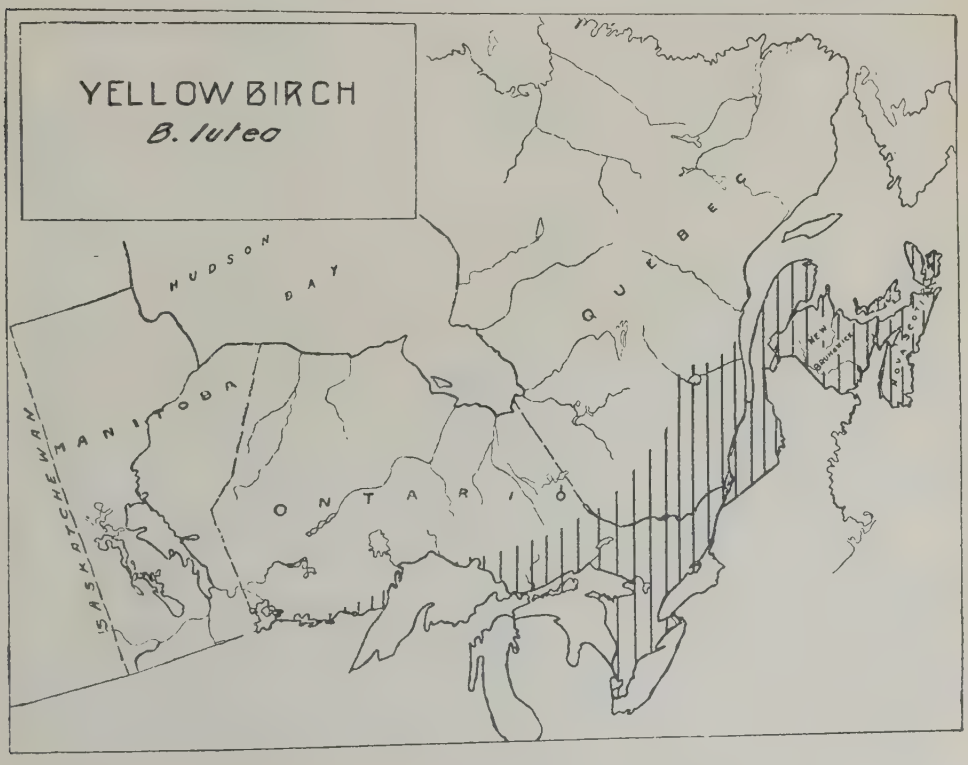
The yellow birch is found from Newfoundland and the Maritime Provinces westward to the east side of lake Superior, also west of this lake from Fort William along the international boundary to the Lake of the Woods.

It is the largest of our native birches and is sometimes found 100 feet high and with a diameter of 3 to 4 feet. In the forest the trunk is long and clear and has a moderate amount of taper. In the open the crown is wide-spread, but the central axis is fairly well defined.

This birch gets its name from its yellowish, straw-coloured bark. On young trees it is smooth, but as the tree gets older it peels into papery bands with curled ends, which form a fringe along the length of the trunk.

The twigs are light brown, shiny, and smooth, and the winter buds are pointed, light chestnut-brown, and about ¼ inch long.

The leaves are 3 to 4 inches long, and coarsely toothed as compared with those of the other birches. They are dull green above and downy beneath, especially along the veins. The stems are short, slender, grooved, and downy.



BIRCHES (*Betula*)

	WHITE (*B. papyrifera*)	YELLOW (*B. lutea*)	SWEET (*B. lenta*)	WIRE (*B. populifolia*)	ALASKA (*B. alaskana*)	WESTERN (*B. papyrifera* var. *occidentalis*)	MOUNTAIN (*B. fontinalis*)
BARK	White outside and brown beneath outer layers. Splits readily into thin, tough layers.	Yellowish straw colour. Forms a fringe of curly strips on older trees. Not so aromatic as the sweet birch	Dark brown, smooth and never peels. Resembles that of cherry. Inner bark is very aromatic.	Dirty white chalky surface. Does not peel. Black triangular patches below the branches are characteristic.	White to brown. Firm but can be separated into thin scales.	Brown, smooth and shiny. Can be separated into layers.	The dark, red, shiny bark is one of the tree's chief distinguishing points. It does not separate into layers.
TWIGS BRANCHES and WINTER BUDS	Twigs coarser and smoother than those of the white birch. Smooth and slightly sticky where the buds join the stem. Buds sticky and larger than those of other birches. Branches stouter than those of other birches.	Twigs shiny, smooth and light brown, resemble those of sweet birch but not so distinctly sweet or aromatic.	Twigs shiny, smooth and dark brown. They have a very aromatic wintergreen flavour. The buds are more divergent than those of the yellow birch.	Twigs wiry and have a tendency to hang down. End of twig is very rough to the touch. Buds small, pointed, and waxy.	Twigs smoother than those of the western birch.	Twigs minutely hairy at first, later become rough to touch. Buds narrow.	Twigs smooth, delicate and hanging.
LEAVES	Oval in outline with base rounded or wedge-shaped rather than square as with the white birch. The upper surface is dull and the margin is doubly toothed. The stems are short and downy.	Much like sweet birch but is larger toothed. Teeth more widely separated. Thicker in texture than those of the sweet birch. Dull green above. Stems exceedingly downy.	The base of the leaf is more deeply scalloped or heart-shaped than those of the other birches. Teeth fine and of fairly uniform size. Softer hair on underside than on the yellow birch.	Triangular in outline with a long tapering point. Bright shiny green. The margin is doubly toothed. Stems smooth, and longer than those of paper birch.	Smaller than the western and larger than the mountain birch. Broadly oval in outline with base somewhat tapered. Tip more drawn out than is the case with the western birch.	Larger than the Alaska or mountain birches. Broadly oval in outline with base somewhat straight.	Smaller than either Alaska or mountain birch leaves. Circular in outline and coarsely toothed.
FRUIT	Catkins sometimes clustered in 2's but usually in 3's.	Catkins not clustered. Larger in diameter than those of the sweet birch. Cone scales hairy	Catkins not clustered as a rule. Cones not so large as those of the yellow birch.	Catkins singly or in pairs, usually singly.	See western and mountain birches.	Cones larger than those of the Alaska or mountain birches.	Cones smaller than those of the Alaska or western birches.

This is the most important hardwood sawn into lumber in Canada. It is of good weight, averaging about 43 to 44 pounds per cubic foot air-dry, and, while easily worked, is strong and hard enough to withstand wear and mechanical stresses. Its use for flooring, furniture, interior finish, vehicle stock, agricultural implements, veneer, handles, turnery, and similar uses is increasing. Small trees and mill waste are used in wood distillation. While the plainer timber of this species is still often stained to resemble walnut or mahogany, the natural appearance of slightly figured wood is so attractive that natural finish or light stain finishes that preserve the natural sheen and figure of the wood are coming into extensive use. It takes paint and enamel well, and the less ornamental timber is widely used with such finishes.

Betula lenta L. **Sweet Birch**

Other common names: Cherry birch, red birch, black birch.
French names: Bouleau merisier, merisier rouge, merisier odorant, bouleau acajou, bouleau à sucre.

The distribution of the sweet birch in Canada has not yet been well defined. It has been reported by lumbermen and others from Nova Scotia to northwestern Ontario, but there are reasons to believe that it has been confused in many cases with the yellow birch (*Betula lutea*), a tree which occasionally develops specimens with bark somewhat resembling that of this tree. It is, therefore, possible that the sweet birch does not extend much beyond those parts of Quebec and New Brunswick that border on the international boundary, where the tree enters Canada from the south.

It is a medium-sized tree about 50 feet high with diameter averaging 1½ to 2 feet, but occasionally reaching a height of 75 feet and a diameter of 3½ or 4 feet. On very poor soil it is a mere shrub-like tree with a stunted appearance. The branches are numerous and spread out from the stem at a wide angle, but form a rather narrow crown. The smaller twigs and branches droop.

The bark on younger trees is dark brown and smooth, and resembles very much that of the cherry, whence the name "cherry birch" sometimes applied to it. On old trees the bark is thick and almost black, and is broken by shallow grooves into flat plates, which turn up at the edge. It is very aromatic and is frequently distilled for the winter-green flavouring that is produced from an essential oil it contains.

The shiny, brown, slender, smooth twigs have also a very aromatic flavour, more distinct than those of the yellow birch.

The winter buds are slender, pointed, reddish-brown, and, like those of most birches, set upon small, spur-like shoots. They stand off more from the twig than do those of the yellow birch.

The leaves are 2½ to 5 in. long, and dark waxy-green in colour. In outline they are oval-pointed and have many fine teeth, finer than those of the yellow birch. The base is more deeply scalloped or heart-shaped than that of the leaf of any other birch. The under side is hairy. The stems are stout, hairy, and deeply grooved.

The wood is more highly prized for furniture and cabinet work than that of yellow birch, because of its deeper colour and its satiny lustre. As a general rule the two species are not separated as lumber and are sold together.

Betula alaskana Sarg. **Alaska Birch**

French name: Bouleau d'Alaska.

Very little is known of the Alaska birch or its range. It has been found from central Saskatchewan to the mouth of the Mackenzie river and westward in northern British Columbia, Yukon district, and Alaska.

It is a small tree commonly 20 to 30 ft. in height but occasionally higher, and at the present time it is of no commercial importance.

The bark is white to reddish-brown, thin, and firm, but can be separated into thin scales. The bark of the mountain birch cannot be separated in this way.

The leaves are very much like those of the Western white birch, except that they are usually smaller and their tips are longer or more drawn out. They are thin, smooth, and dark green. The stems are slender and reddish.

The catkins, which are 1 to $1\frac{1}{4}$ in. long, are larger than those of the mountain birch.

Betula fontinalis Sarg. **Mountain Birch**

Other common names: Red birch, black birch.
French name: Bouleau fontinal.

The mountain birch is a small, shrub-like tree 15 to 20 ft. high, of little or no commercial importance. Its range is not perfectly known but it has been reported in various places throughout British Columbia south of the Peace river and east of the Coast range, also in western Alberta in the foot-hills of the Rocky mountains. It is distinguished from the other western birches by its dark red, shiny bark that does not peel or separate into thin layers.

The leaves, too, are much smaller than those of the Western white birch and more nearly circular in outline. The margins are very coarsely toothed.

The cone-like catkins are, on the whole, shorter than those of the other western species.

THE ALDERS

Twenty species of alder (*Alnus*) are recognized. They are widely distributed throughout the temperate and cooler regions of North America, also in South America, Europe, and southern Asia. A few of them attain tree size, but for the most part they are shrubs growing in dense thickets along the banks of streams and on wet slopes. Of the five or six native species the red, Sitka, and mountain alders of the Pacific coast and the speckled alder of the East sometimes reach tree size.

All the alders resemble each other in their astringent bark and their winter buds, which are stalked or raised on more or less well-defined stems. The witch hazel has also this stalked bud, but can be distinguished by the fact that it is more densely downy than those of the alders.

For illustration of the twigs and winter buds of this genus, see the second of the plates "Miscellaneous Twigs" at the end of this volume.

Alnus incana (L.) Moench **Speckled Alder**

Other common names: Hoary alder, alder.
French name: Aune commun.

The speckled alder is common in the swamps and along the borders of streams from the Atlantic to the prairies. It is a small, shrubby tree 6 to 15 ft. in height, and usually composed of several stems which spring off close to the ground.

The bark is smooth, greyish-brown, and blotched with white spots. The twigs are slender and somewhat zigzag in growth. They are greyish-brown, usually downy towards the tip, and conspicuously marked by white lenticels.

The winter buds are distinctly stalked and resemble somewhat those of the witch hazel but are not so densely downy.

The leaves are a broad oval in outline, usually with rounded base, dark green, and conspicuously veined with straight ribs. The underside is usually covered with a hoary bloom.

The flowers are in catkins clustered at the ends of the drooping tips of the twigs. The fruit is an oval, woody, cone-like catkin ½ in. long, which remains on the tree all winter. The seed is winged, small and flattened.

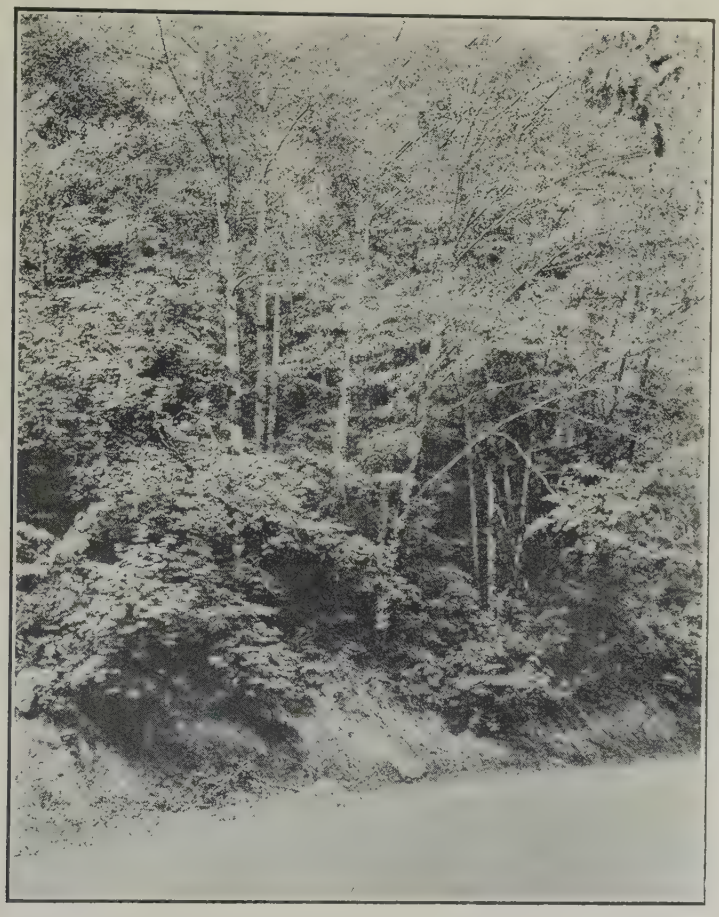


Photo. 3863A. *A. Knechtel.*

Red alder (*Alnus rubra*).

Alnus rubra Bong. **Red Alder**

Other common names: Oregon alder, Western alder.
French name: Aune de l'Oregon.

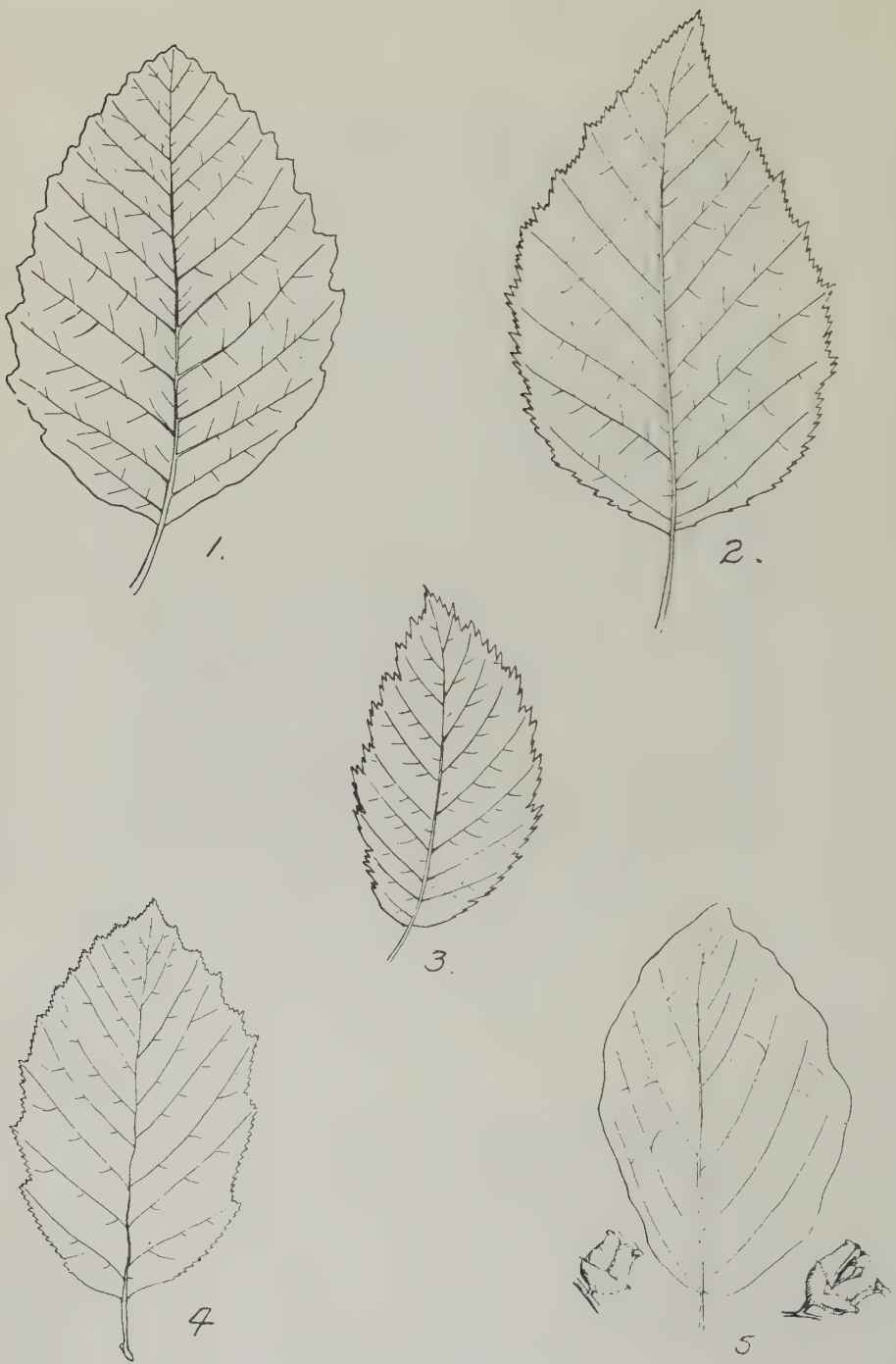
The red alder is confined to the Pacific coast, and in Canada is found only on the Coast range and the islands of British Columbia.

It is the largest alder in Canada, frequently 40 ft. high by 1 ft. in diameter, but sometimes much larger.

The trunk is usually straight, and the branches are slim. The bark is light grey and is smooth except on large trees, when it is roughened by thin, narrow, flat ridges. The twigs are shiny, dark red, and covered with numerous light-coloured spots. The winter buds are dark red and downy.

The leaves are 3 to 5 in. long and deep yellowish-green in colour, having the underside slightly hairy, and the margins somewhat turned up.

The fruit is cone-like, ½ to 1 in. long, and the tiny seeds have a very thin, wing-like margin.



Alder and Witch Hazel Leaves

1 Red alder (*Alnus rubra*). 2 Sitka alder (*Alnus sinuata*). 3 Mountain alder (*Alnus tenuifolia*). 4 Speckled alder (*Alnus incana*). 5 Witch hazel (*Hamamelis virginiana*).

The wood has a pale reddish-brown colour, is light in weight, and has a fine uniform texture which gives it the capacity to take paint and enamel finishes very well. Its uniform qualities also render it suitable for turnery and for core-stock. It is easily worked, nails readily, has a pleasing appearance when finished, and is used for furniture, cabinet work, woodenware, and novelties.

Alnus sinuata Ryd. **Sitka Alder**

The Sitka alder occurs from the Arctic circle southward through Alaska and the valley of the Yukon river, along the coast of British Columbia and the Rocky mountains to the international boundary. In the United States it grows as far south as Colorado. It is fairly common in the northern part of its range where it grows in moist bottoms and marshy flats along with the willow, but is not ordinarily distinguished from other alders.

It is usually an arborescent shrub, but sometimes becomes a tree 30 ft. in height and 8 in. in diameter. Its wood is used with that of red alder (*Alnus rubra*).

The bark is smooth and grey with a bluish tinge. The twigs are yellowish-brown, shiny, and minutely hairy.

The leaves are thin, papery, yellowish-green, shiny beneath, and, when young, sticky. In shape they are much like those of the red alder, except that they are often a little more drawn out and pointed. The margin, too, is more sharply toothed.

The catkin is $\frac{5}{8}$ to $\frac{3}{4}$ in. long. The tiny seed has a wing that is much more conspicuous than that of either the red or the mountain alder.

Alnus tenuifolia Nutt. **Mountain Alder**

The mountain alder ranges from Yukon territory southward throughout British Columbia. It received its common name because of its high mountain habitat, by which it is ordinarily distinguished.

Commonly it is only a shrub growing in dense thickets, but sometimes becomes a crooked tree 20 to 25 ft. in height.

The bark is smooth, thin, and greyish-brown on the trunk. On new twigs it is pale brown, shading from purple-red to grey. The twigs of the Sitka alder, on the other hand, are a shiny yellowish-brown, marked with light-coloured specks.

The leaves of the mountain alder closely resemble those of the Sitka alder but on the whole are a little more coarsely toothed.

THE IRONWOOD

Three of the five known species of ironwood (*Ostrya*) are found in North America; of these only one occurs in Canada. The others are found in southern Europe, southwestern Asia, and Japan They are small trees of minor importance but are sometimes planted for decorative purposes.

Ostrya virginiana (Mill.) K. Koch **Ironwood**

Other common names: Rough-barked ironwood, hornbeam*, hop hornbeam*.

French names: Ostryer de Virginie, bois dur*, bois de fer.

The ironwood is a small tree found from Nova Scotia to Ontario, and is associated with such hardwoods as beech, sugar maple, white ash, and white elm

It reaches the height of 25 to 35 ft. and the diameter of 12 in.

Its bark is light grey and roughened by thin, flat flakes or scales, which loosen at the ends. This characteristic distinguishes it readily from the beech.

The twigs of these two species are somewhat alike in winter but can be distinguished by the shorter buds on the ironwood.

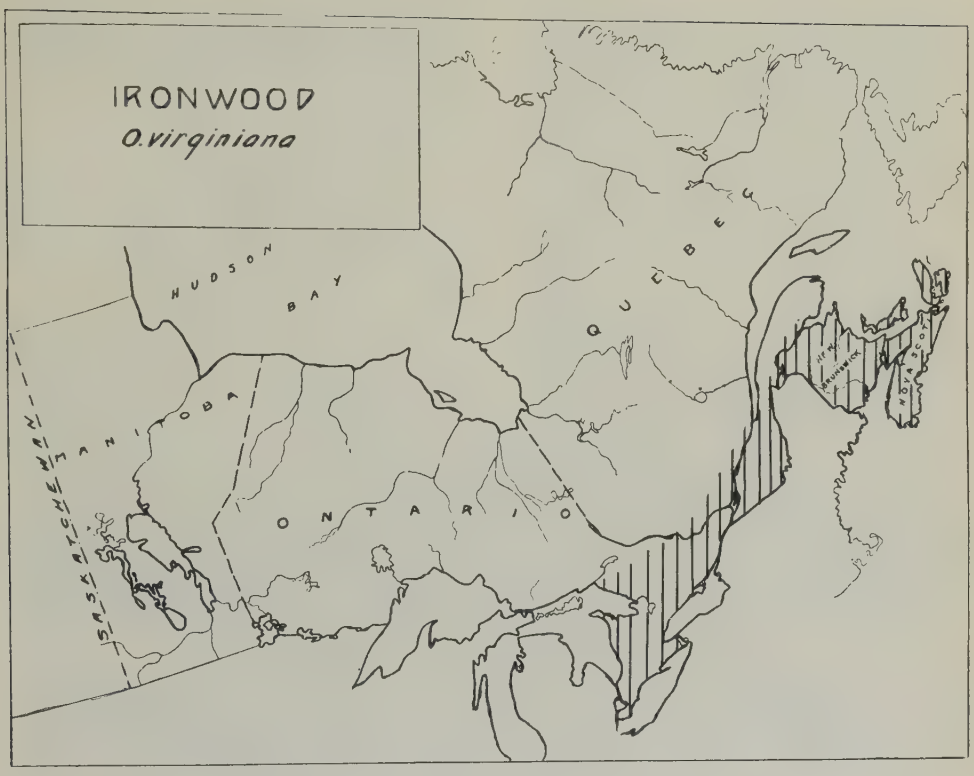
The leaves of the ironwood are somewhat like those of the birch in general appearance. They are finely toothed, light green, rough to the touch, and have stems about $\frac{1}{2}$ in. long.

Photo. 11011. *R. H. Campbell.*

Ironwood (*Ostrya virginiana*)

The fruit is hop-like in appearance and each contains a small, seed-like nut. The fruit remains on the tree during the winter.

Its wood is one of the hardest and toughest of native woods and is used locally for vehicle stock, handles, and spring-poles. It is suitable for making strong bows. Owing to the small size usually attained the tree is not important as a lumber producer, but is used for wood distillation when available.



THE BEECH

Nine species of beech (*Fagus*) are known and all are found in the northern hemisphere. Only one species is native to this continent, the so-called "blue beech" (*Carpinus caroliniana*) being entirely distinct from the true beech. Several ornamental varieties of European origin are grown by nurserymen.

The beeches are readily recognized by their three-angled nuts, smooth grey bark, and long, sharp-pointed, lance-shaped buds.

Fagus grandifolia Ehrh. **Beech**

Other common names: American beech, red beech.
French names: Hêtre, hêtre rouge.

The beech in Canada is found throughout the hardwood region from Nova Scotia to the north shore of Georgian bay, but it does not extend as far north as yellow birch and sugar maple.

It is sometimes found in almost pure stands, but is usually mixed with other native hardwoods.

When growing in a dense stand it reaches a height of 70 to 80 ft. and a diameter of 2 to 4 ft. In the open the clear trunk is much shorter and the crown is large and rounded.

The clean, smooth, close-fitting, light grey bark of the trunk has made this tree one of the best known wherever it occurs. Except when young it is rarely mistaken for any other tree, even in winter.

The blue beech (*Carpinus caroliniana*) has a bark somewhat similar to that of the true beech and for that reason is sometimes mistaken for this tree. They are, however, readily distinguished by their winter buds, leaves, and fruit.

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The twigs of the beech are brown, smooth, lustrous, and set with shining, brown, pointed buds about 1 in. long.

The leaves in outline are oblong and pointed, with the margin sharply saw-toothed. The veining is conspicuous, the fine veins running straight from the centre rib to the edge. The texture is exceedingly fine and the leaf is soft to the touch.

The fruit is a tiny, three-cornered, sharp-pointed nut, occurring in pairs enclosed in a prickly bur or husk. When ripe this bur splits into four sections and allows the nuts to drop out.

The wood is heavy, hard, and strong, and is used for flooring, furniture, vehicle stock, ties, cooperage, handles, wood distillation, and firewood.

Photo. Geological Survey, Canada.

Beech (*Fagus grandifolia*)

THE BLUE BEECH

About a dozen species of *Carpinus* are known, but only one is native to this continent, and it is small in size and in economic importance. One of the largest species, *Carpinus betulus*, is found in Siberia where it is of considerable importance.

These trees belong to the same family as our ironwoods, birches, alders, and hazelnuts, which resemble one another in many respects, but can all readily be distinguished one from another by their fruits.

Carpinus caroliniana Walt. **Blue Beech**

Other common names: Water beech*, ironwood*, smooth-barked ironwood, hornbeam*, hop hornbeam*.

French name: Charme d'Amérique.

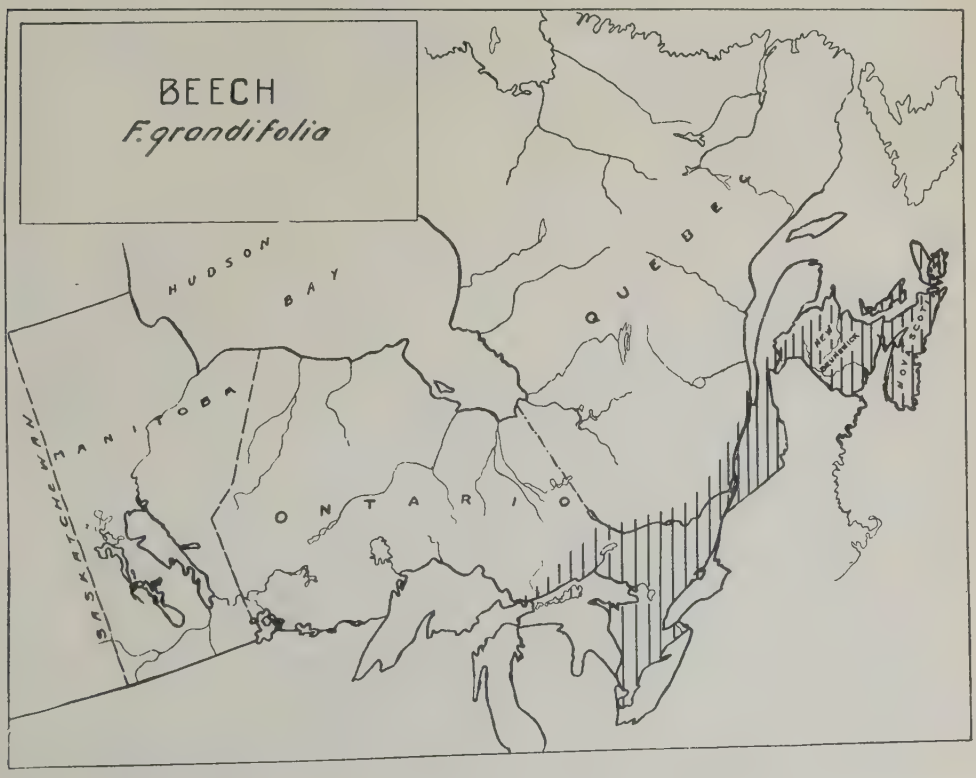
The blue beech is common throughout the hardwood region of Nova Scotia, western and southern Quebec, to the north shore of Georgian bay in Ontario. It is not a true beech, but derives its name from the fact that its bark resembles that of a beech.

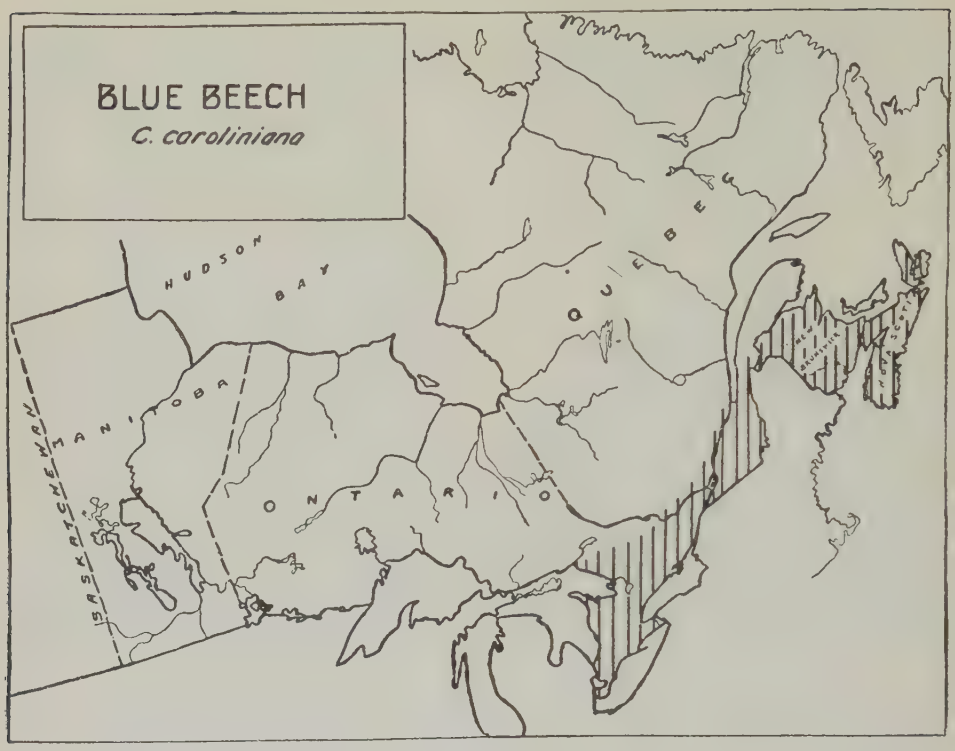
Photo. 8574. *B. R. Morton.*

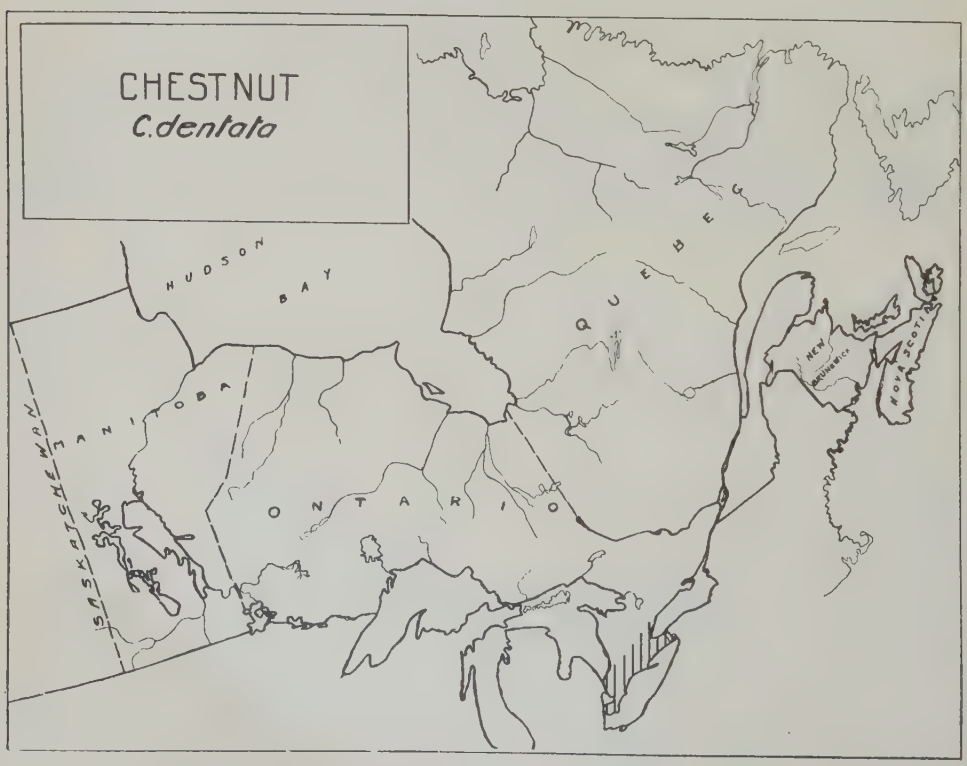
Ironwood (*Ostrya virginiana*): trunk and bark

Photo. 8750. *B. R. Morton.*

Beech (*Fagus grandifolia*): trunk and bark




BLUE BEECH
C. caroliniana
HUDSON BAY
QUEBEC
ONTARIO
SASKATCHEWAN


CHESTNUT
C.dentata
HUDSON BAY
QUEBEC
ONTARIO
SASKATCHEWAN
NEW BRUNSWICK
NOVA SCOTIA

MISCELLANEOUS LEAVES AND TWIGS

1 Chestnut (*Castanea dentata*). 2 Beech (*Fagus grandifolia*). 3 Service-berry (*Amelanchier canadensis*). 4 Ironwood (*Ostrya virginiana*). 5 Blue beech (*Carpinus caroliniana*).

CHESTNUT, BEECH, BLUE BEECH, IRONWOOD, AND SERVICE-BERRY

	CHESTNUT (*Castanea dentata*)	BEECH (*Fagus grandifolia*)	BLUE BEECH (*Carpinus caroliniana*)	IRONWOOD (*Ostrya virginiana*)	SERVICE-BERRY (*Amelanchier canadensis*)
BARK	Rough with coarse ridges on old trees. Smooth as a rule on trees under 8 in. in diameter.	Clean, close-fitting, smooth, and grey or steel-blue.	Smooth, close-fitting, but a darker grey than the beech. Trunk often fluted.	Roughened by thin, flat, loose flakes. Resembles somewhat that of a young white oak.	Smooth, close-fitting, greyish-brown on young trunks often streaked with dark longitudinal lines.
TWIGS	Coarser than beech. Roughened by ridges or grooves which run down from each side of the leaf-scars. Often tinged with yellow.	Slender, smooth and polished.	Similar to those of the beech but arranged in a flat, spreading spray.	Dark green dotted with brown, later light reddish-brown.	Slender, grey, and with a slightly bitter taste.
WINTER BUDS	Small, rounded and yellowish-brown.	Narrow, sharp-pointed and conspicuously long	Pointed and slightly gummy. Smaller than those of the beech. Whitish down on the margin of the scale.	Smooth and pointed. The points turned out from the stem. Not as long as the beech and larger than those of blue beech.	Long, narrow, and sharp-pointed like beech but do not stand out from the twig in the same way. Scales fewer in number than those of the beech. Edged with pale hairs.
LEAVES	Surface has a corrugated appearance. Teeth resemble those of a circular saw.	Fine teeth widely separated. Thin and soft to touch, Green on both sides about the same shade.	Unevenly toothed. Coarse texture. Stems about ½ in. long	Somewhat resemble those of the elm. Rough to touch. Stem about ¼ in. long.	Finely toothed. Smooth surface. Somewhat resemble the leaf of the pear but finer in texture.
FRUIT	Bur large, round and sharp-spiny. Nut thin-shelled, wedge-shaped and edible.	Bur spiny and four-sided. Nut thin-shelled and distinctly ridged and triangular in cross-section.	Small round nut on a three-pointed leaflet.	Hop-like in appearance Small seed-like nut in a papery sac.	Dark purple, edible berry.

It is a small tree, ordinarily 15 to 20 ft. in height and 4 to 8 in. in diameter. It is frequently an unshapely, bushy tree with a leaning trunk. The crown is flattened and composed of long branches of irregular growth and many fine, supple, drooping twigs which are arranged in a flat, spreading spray. The bark of the trunk is smooth and close-fitting, and resembles that of the beech, except that it is a darker or bluish grey. The trunk is often swollen in ridges or fluted.

The leaves are 2 to 4 in. long, ovate-oblong in shape, with margins unevenly toothed and coarse in texture. The stems are about $\frac{1}{2}$ in. long.

The fruit is in the form of a tiny nutlet. These occur in pairs and are each attached to three-lobed, leaf-like wings.

The character of its bark and the fact that it is found growing in the shade of other hardwoods are the only points in which it resembles the true beech. The winter buds, leaves, and fruit are quite different, and any of these would enable these two trees to be distinguished.

The wood is used locally on account of its hardness and toughness, but it does not reach a size to make it commercially important. It is used with other hardwoods in wood distillation.

THE CHESTNUT

Four species of chestnut (*Castanea*) are known. Three of them are native to North America, of which only one is found in Canada. The common horse chestnut (*Aesculus hippocastanum*) is not a true chestnut, neither is it a native of this country, although largely planted as an ornamental tree in our eastern towns and cities.

The chestnut (*Castanea*) is frequently cultivated for its nuts, and several horticultural varieties have been produced. The wood is highly prized for the manufacture of tanning extracts, and also for posts and poles, because of its durability in contact with the soil.

The chestnut can be easily distinguished from any other native tree by its very spiny bur which contains one or more shiny, brown, thin-shelled, sweet, edible nuts.

Castanea dentata (Marsh.) Borkh. **Chestnut**

Other common name: Sweet chestnut.
French names: Châtaignier d'Amérique, châtaignier.

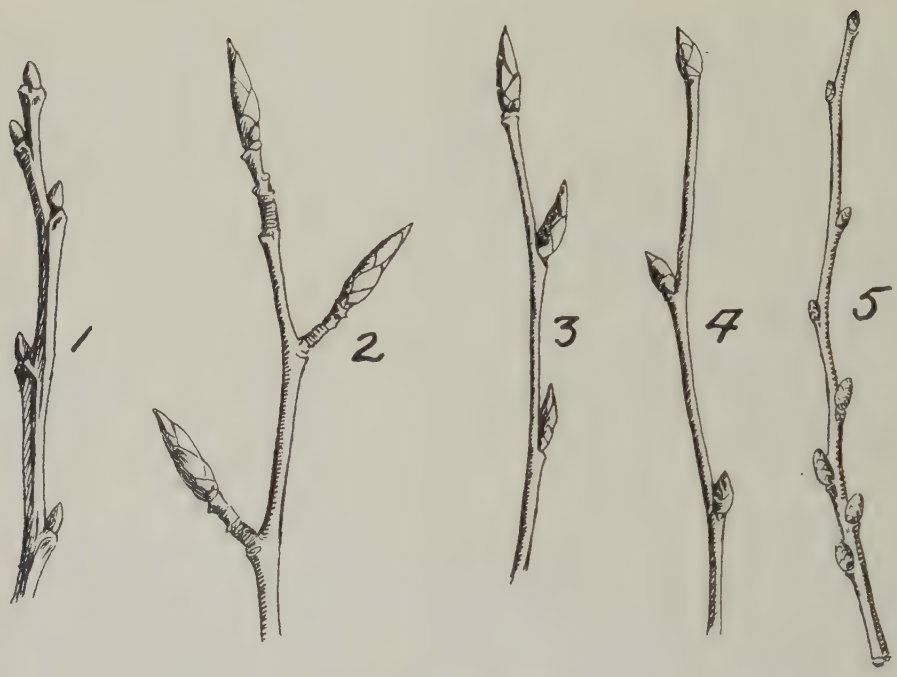
The chestnut is found growing naturally in Canada only in a small part of southern Ontario, namely, that part from the Niagara river and lake Ontario westward to the Detroit river and lake St. Clair. Here it is fairly common throughout the farmers' woods, associated with the various other hardwoods of that region. This is the tree that produces the sweet or edible chestnut and, as stated above, should not be mistaken for the horse chestnut.

It is a large tree 75 to 80 feet in height, and 2 to 3 feet in diameter, sometimes reaching a height of 100 feet. The trunk is usually long and straight, and has little taper except when grown in the open, where it divides into a few, heavy branches not far from the ground and forms a very broad, rounded crown.

The bark is roughened by deep longitudinal furrows into coarse ridges on the larger trunks, but on young trees up to about 8 inches in diameter it is comparatively smooth and resembles that of the red oak.

The twigs have a yellowish tinge and are stout and smooth. In cross-section they are somewhat irregular, owing to slight ridges that run from each side of the leaf-scars.

The winter buds are $\frac{1}{4}$ in. long, rounded, and chestnut-brown in colour. They are not clustered at the end of the twig as are those of the oaks, trees with which the chestnut might be confused.



Miscellaneous Twigs

1 Chestnut (*Castanea dentata*). 2 Beech (*Fagus grandifolia*). 3 Service-berry (*Amelanchier canadensis*). 4 Ironwood (*Ostrya virginiana*). 5 Blue beech (*Carpinus caroliniana*).

The leaves are 6 to 8 in. long, narrow, and taper-pointed. The margin is coarsely toothed with curved teeth that resemble those of a circular saw. The veining is prominent and feather-like, and the dark, shiny, green surface has a corrugated appearance.

The somewhat wedge-shaped nuts are protected by an extremely spiny bur. They are thin-shelled and edible, and too well-known to need further description.

The wood is pale brown in colour and is usually characterized by wide growth-rings, each of which is marked by a row of large pores which gives this wood a pronounced growth-ring figure. It is extensively used for core-stock, interior finish, and cabinet work generally. It is resistant to decay and is valuable for posts, poles, and railway ties, and as a source of tanning extract. Very little chestnut lumber is produced in Canada.

Commercial stands in the United States have almost all been destroyed by the chestnut blight, but the species is coming back in places.

THE SERVICE-BERRIES

The service-berry, or shadbush, group (*Amelanchier*) is widely distributed throughout the world. Most of the species are shrubs, but three of the native species sometimes reach tree size. Two of them, *Amelanchier canadensis* and *Amelanchier obovalis*, are eastern species which resemble each other very much and ordinarily go by the same common name. The latter, however, owing to its somewhat longer or narrower leaves, sometimes receives the name of "long-leaf" shadbush. The *Amelanchier alnifolia* is the western species.

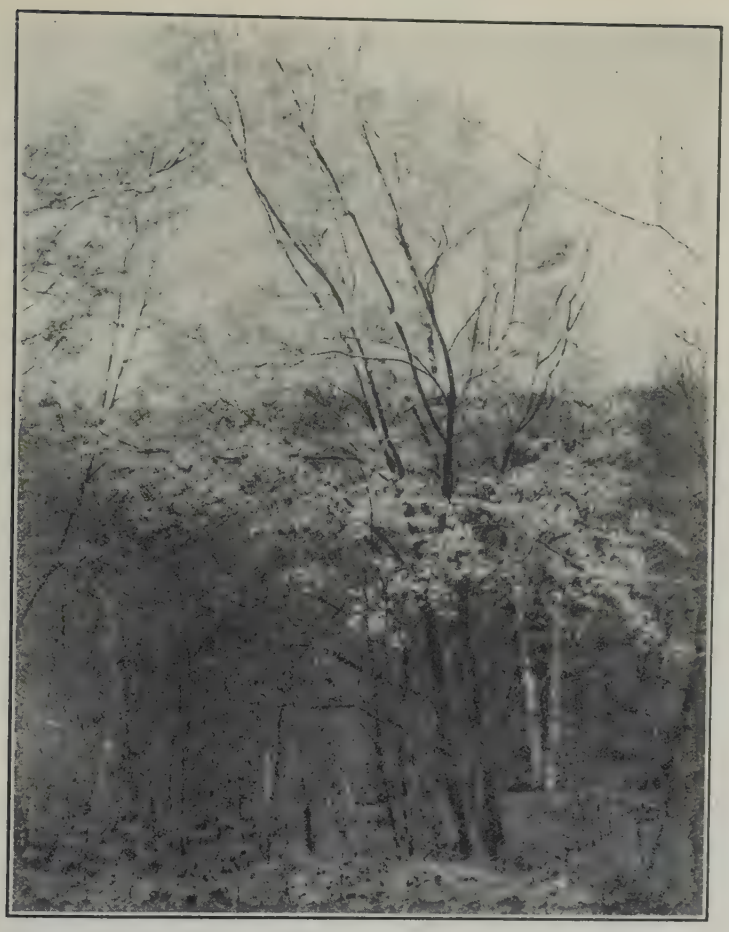


Photo. 8594. *B. R. Morton.*

Service-berry (*Amelanchier canadensis*)

They have pretty, white flowers in spring and on that account are sometimes used for ornamental planting. The fruit of all species is sweet, berry-like, and edible.

Amelanchier canadensis (L.) Medic. **Service-berry**

Other common names: Shadberry, Juneberry, wild pear, lancewood*.

French names: Amélanchier du Canada, petites poires.

The service-berry is a small tree 15 to 25 ft. high with a diameter of 4 to 8 in. Sometimes it is found growing like a shrub with many stems in a clump. It inhabits well-drained soils, such as hillsides in open woods, and, in Canada, is found from Nova Scotia westward throughout the St. Lawrence valley to the north shores of lake Superior, but is nowhere abundant.

The smooth, close-fitting, greyish-brown bark might lead one to mistake it for a young beech. The bark of the service-berry, however, is darker, as a rule, and on young trunks is quite often streaked with dark, longitudinal lines.

The winter buds, too, resemble those of the beech, being long, narrow, and sharp-pointed, but they are pressed close to the stem and do not stand out at

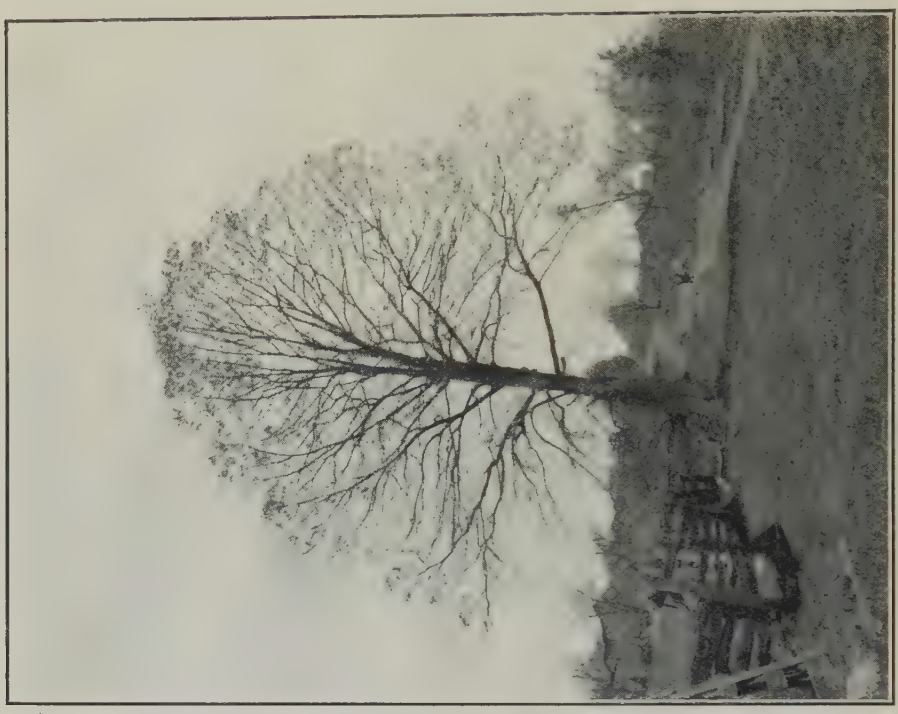


Photo. 8579. B. R. Morton.

Swamp white oak (*Quercus bicolor*)

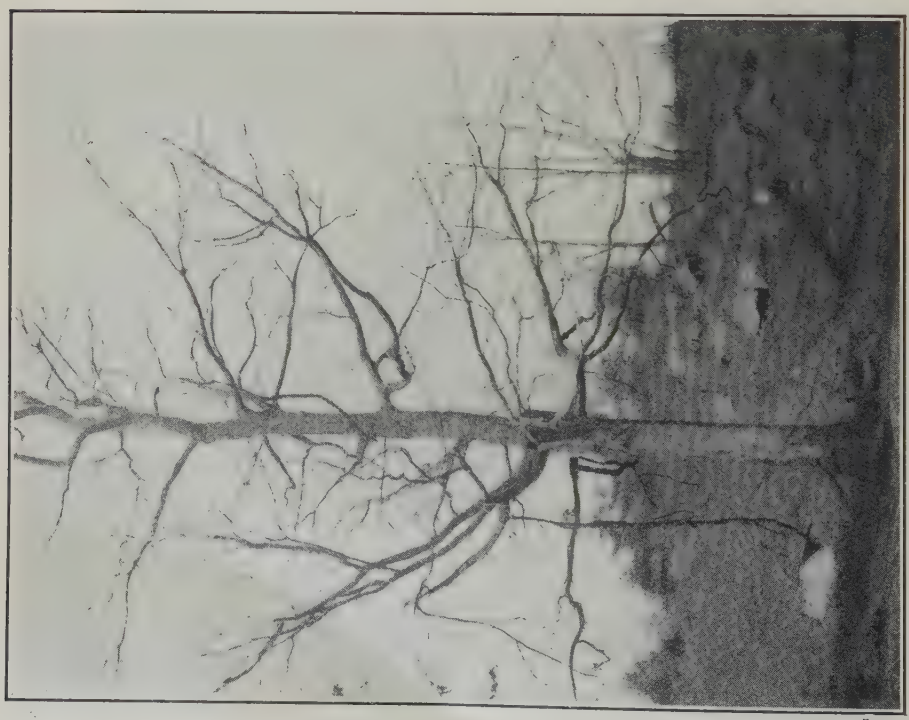


Photo. 8604. B. R. Morton.

White oak (*Quercus alba*)

the wide angle so characteristic of the beech buds. The bud scales are edged with white, those of the beech are not. They are also fewer in number.

The finely toothed, smooth-surfaced leaf, however, would never be mistaken for the leaf of the beech. It resembles somewhat that of the pear but is of finer texture.

It is a conspicuous tree in the spring, when covered with its many white flowers. The fruit is a dark-purple, edible berry, about the size of a currant, and ripens in July.

Its wood is occasionally used for handles, fishing-rods, bows, and small turnery, and is sometimes sold as lancewood.

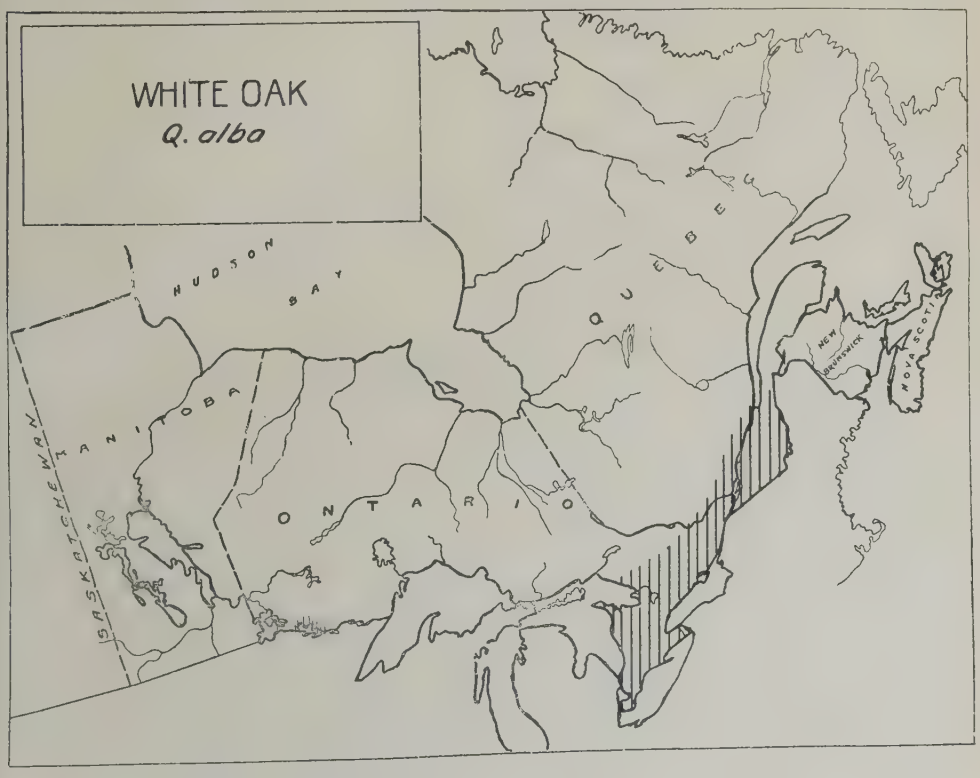
Amelanchier alnifolia Nutt. **Saskatoon**

Other common names: Western service-berry, shadbush.
French name: Amélanchier à feuilles d'aulne.

The saskatoon in Canada is found from Alaska south throughout British Columbia, and eastward to Georgian bay in Ontario. It is seldom found as a tree, but is more commonly a shrub 8 or 9 ft. in height; in the prairie region it is usually 3 or 4 ft. high.

It resembles the eastern tree forms of the Amelanchiers but can be distinguished by its leaves. These are rounder in outline, and the lower half of the margin is smooth, while the upper half is coarsely toothed.

The fruit is sweet and edible and resembles the huckleberry in appearance. It is much sought after by the settlers in the West where it is commonly called the saskatoon berry.



OAK LEAVES

1 Black oak (*Quercus velutina*). 2 White oak (*Quercus alba*). 3 Red oak (*Quercus borealis*). 4 Scarlet oak (*Quercus coccinea*). 5 Swamp white oak (*Quercus bicolor*). 6 Post oak (*Quercus stellata*). 7 Bur oak (*Quercus macrocarpa*). 8 Chestnut oak (*Quercus montana*). 9 Pin oak (*Quercus palustris*). 10 Garry oak (*Quercus Garryana*). 11 Chinquapin (*Quercus Muehlenbergii*).

THE OAKS

The oaks (*Quercus*) are widely distributed throughout the north temperate zone of both hemispheres. Only a few species are found south of the equator. Approximately three hundred species have been described. Fifty-two species are found in North America, of which forty-seven reach tree size. Twelve species have been found in Canada, most of them confined to the southwestern peninsula of Ontario. One species is found in British Columbia. All the native species reach tree size except the dwarf chinquapin oak (*Quercus prinoides*).

The wood of the oaks is generally heavy, hard, and strong. It has a pronounced growth-ring figure and is also characterized by the typical ribbon-like stripes across the grain on quarter-sawed surfaces. The figure and the substantial qualities of the wood have kept it in demand for flooring, furniture, and interior finish, so that the better grades bring high prices. There is comparatively little oak timber produced in Canada.

The native species are divided into two groups:

1. White oaks
   Fruit matures in one year
   Inner surface of the acorn shell usually smooth
   Leaves with lobes rounded.

2. Black or red oaks
   Fruit matures in two years
   Inner surface of the acorn shell covered with silky down
   Leaves with lobes pointed and bristle-tipped.

The white oak group includes the following:

White oak	*Quercus alba*
Garry oak	*Quercus Garryana*
Post oak	*Quercus stellata*
Swamp white oak	*Quercus bicolor*
Bur oak	*Quercus macrocarpa*
Chinquapin oak	*Quercus Muehlenbergii*
Chestnut oak	*Quercus montana*
Dwarf chinquapin oak	*Quercus prinoides*

The black or red oak group includes the following:

Black oak	*Quercus velutina*
Red oak	*Quercus borealis*
Pin oak	*Quercus palustris*
Scarlet oak	*Quercus coccinea*

There is considerable variation in the quality of wood within the same species. Wood of the white oaks is very resistant to decay and is generally preferred to that of the black or red oaks.

In both the white and black or red groups there are species which retain their green leaves throughout the winter and are known as evergreen oaks. None of these is native to Canada. They are chiefly confined to the southern Pacific coast.

Quercus alba L. **White Oak**

Other common name: Stave oak.
French name: Chêne blanc.

The white oak is found on well-drained soils in southern Quebec and southern Ontario. It has a diameter of 2 to 4 ft. and a height of 50 to 100 ft. It is a stately tree and in the open develops a very massive, broad crown, composed of far-reaching, stout, twisted limbs. (For range in Canada, see map, page 125.)

Oak Twigs

1 Black oak (*Quercus velutina*). 2 Red oak (*Quercus borealis*). 3 Scarlet oak (*Quercus coccinea*). 4 Pin oak (*Quercus palustris*). 5 White oak (*Quercus alba*). 6 Bur oak (*Quercus macrocarpa*). 7 Swamp white oak (*Quercus bicolor*). 8 Chinquapin oak (*Quercus Muehlenbergii*). 9. Chestnut oak (*Quercus montana*). 10 Post oak (*Quercus stellata*). 11 Garry oak (*Quercus Garryana*).

The bark is light grey, shallow-fissured, and scaly. This scaliness extends to branches 1 in. in diameter.

The twigs, which are smooth, are sometimes covered with a bloom which can be rubbed off. The winter buds are reddish-brown, $\frac{1}{8}$ in. long. They are larger and more pointed than those of the swamp white oak, but less pointed than those of the black oak.

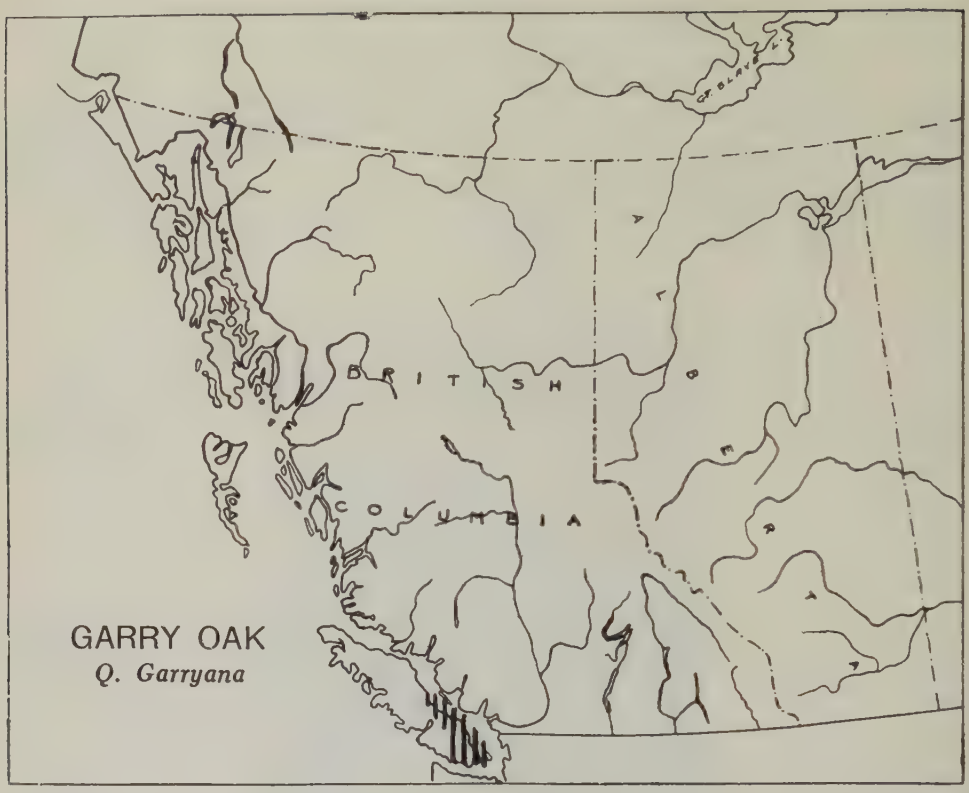
The leaves are 5 to 9 in. long and 3 to 4 in. broad. The lobes are rounded, or blunt, and the notches or indentations are fairly deep, most of them $\frac{1}{2}$ in. or over. The leaves of the swamp white oak are not so deeply notched.

Photo. 8597. *B. R. Morton.*

White oak (*Quercus alba*): trunk and bark

The acorns are $\frac{3}{4}$ to 1 in. in length and are sometimes borne on slender stalks. The cup is shallow and covered with warty scales, which do not form a fringe at the margin. The inside of the shell is smooth and the kernel is sweet. The acorns take but one year to mature.

The technical qualities of this wood have long been understood and appreciated. It is generally conceded to be the most valuable of the oak species. Its more important uses depend on its two main characteristics—its strength and its appearance. The wood is used in greatest quantity at present for interior finish, cabinetwork, and furniture, but in addition to these uses it is purchased by manufacturers of boats, vehicles, cars, caskets, handles, pianos, organs, pumps, refrigerators, and machinery frames. Wood of this and other species of the white oak group is used almost exclusively for tight cooperage for alcoholic liquids. It is also used extensively for ties and timbers because of its power of resistance both to decay and mechanical stresses.



Quercus Garryana Douglas **Garry Oak**

Other common names: Pacific post oak, Oregon oak, Pacific white oak, British Columbia oak.

French name: Chêne de Garry.

The Garry oak in Canada is found only in British Columbia, along the southeastern coast of Vancouver island as far north as Courtenay and inland for about 30 miles, and on the adjacent islands in the gulf of Georgia. It has been reported from the Fraser valley on the mainland. It is not a common tree, and, therefore, is of very little commercial value. Indians formerly used the acorns for food.

On good sites it is a tree 50 to 60 ft. high, and in poor locations is merely a shrub.

It is the only oak native to the Pacific coast in Canada, and therefore not difficult to distinguish from other trees with which it associates.

The young twigs and winter buds are conspicuously hairy. The buds are large for an oak, $\frac{1}{4}$ to $\frac{1}{2}$ in. long.

The leaves in outline resemble those of the white oak of the East. They are deep green in colour, and shiny and smooth on the upper surface. In texture they are leathery and thick.

The acorn is large and the cup is shallow and hairy. The kernel is sweet.

Quercus stellata Wang. **Post Oak**

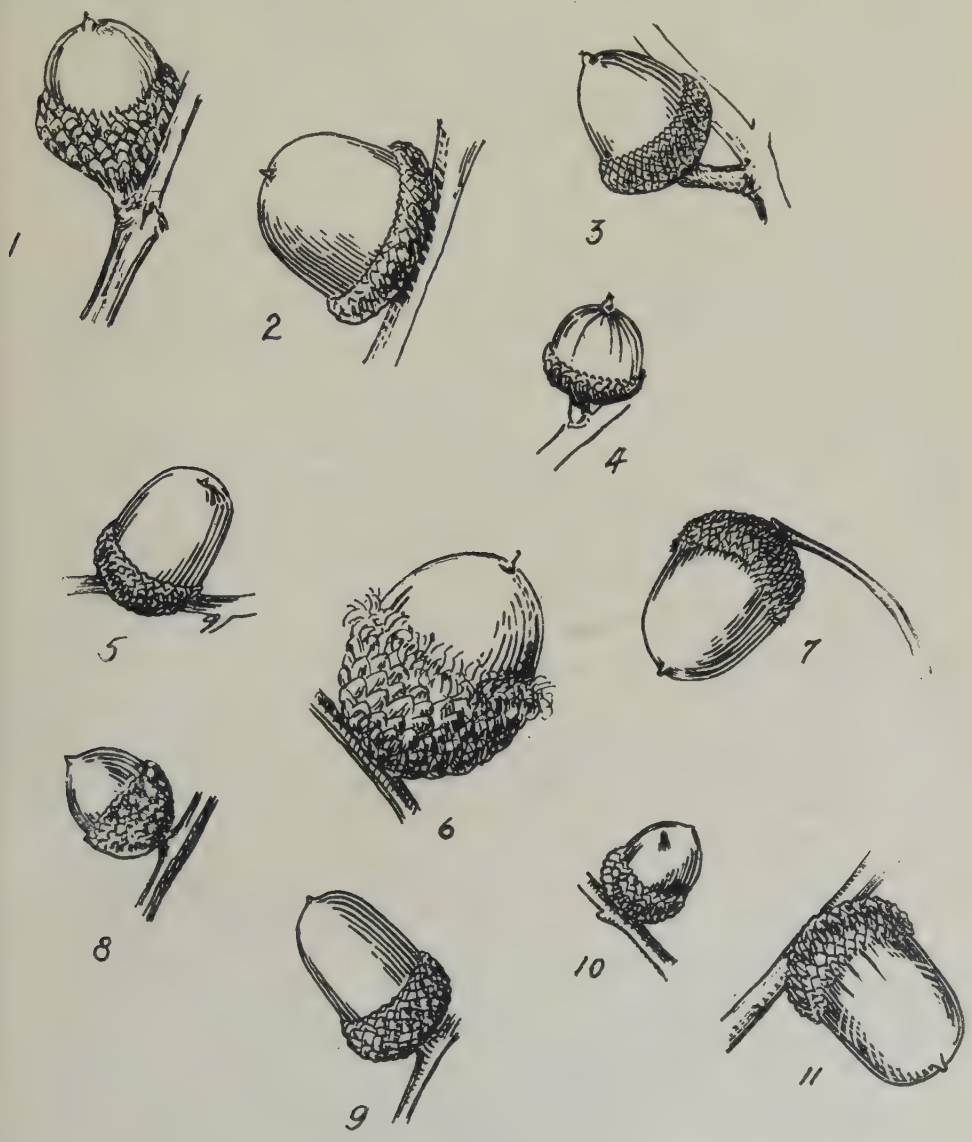
French names: Chêne à lobes obtus, chêne étoilé.

It has been reported that the post oak has been found in southern Ontario, but it is not common and its range in Canada is probably confined to the counties bordering on lakes Ontario and Erie.

It is a small tree 25 to 30 ft. in height, but often a shrub of 10 ft. or less. It has a straggling habit of growth and its stout, spreading branches form a very irregular crown. It has no commercial value in Canada.

The bark is greyish and scaly, and much resembles that of the white oak, except that it is somewhat darker and rougher.

The twigs, which come out abundantly all along the stout branches, are stout, reddish-brown, and when young are covered with a rough down. They soon become roughened by scaly bark. The leaf-scars are raised on conspicuous projections.



ACORNS

1 Black oak (*Quercus velutina*). 2 Red oak (*Quercus borealis*). 3 Scarlet oak (*Quercus coccinea*). 4 Pin oak (*Quercus palustris*). 5 White oak (*Quercus alba*). 6 Bur oak (*Quercus macrocarpa*). 7 Swamp white oak (*Quercus bicolor*). 8 Chinquapin oak (*Quercus Muehlenbergii*). 9 Chestnut oak (*Quercus montana*). 10 Post oak (*Quercus stellata*). 11 Garry oak (*Quercus Garryana*).

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The leaves are 5 to 8 in. long and 3 to 6 in. wide. They vary greatly in shape and have what has been described as a sprawling outline. The lobes are all rounded and the middle pair are usually the largest. This frequently gives the leaf a somewhat cross-shaped outline. The base is wedge-shaped. They are very coarse, rough on both sides, and of a shiny, dark green, which makes the tree conspicuous at some distance.

The acorn is ½ to 1 in. long, reddish-brown, sometimes with darker stripes, and somewhat downy at the tip. The cup is top-shaped and covers from one-third to one-half the nut. The scales are thin and flat. The kernel is sweet and ripens in one year.

Quercus bicolor Willd. **Swamp White Oak**

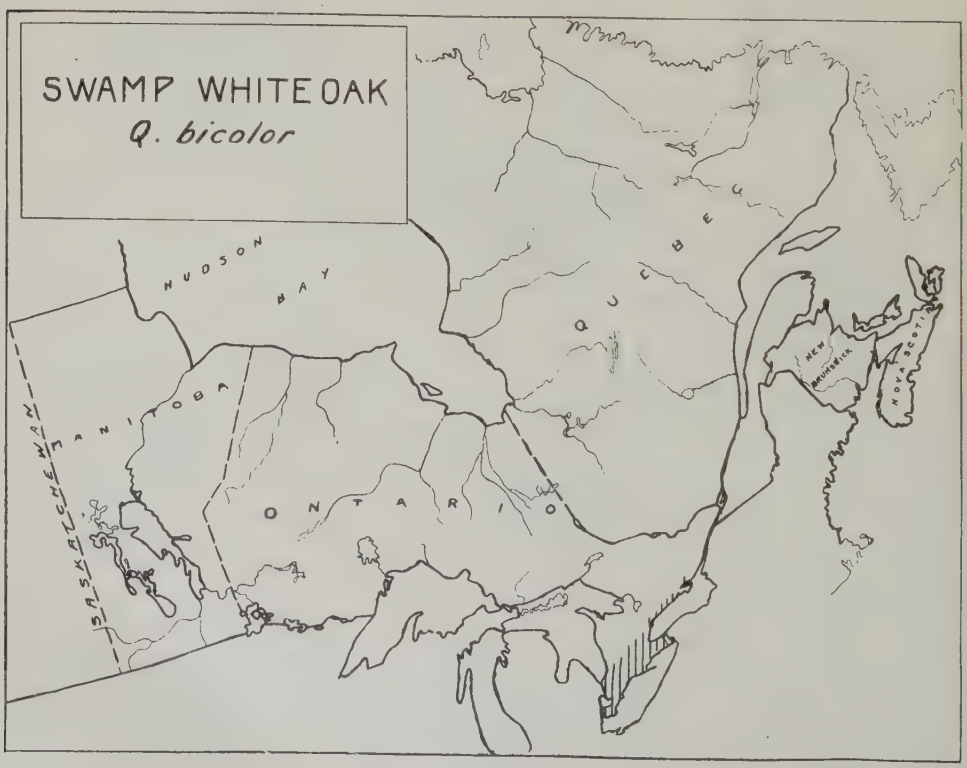
Other common name: Blue oak*.
French names: Chêne bicolore, chêne bleu*.

The swamp white oak, as its name implies, is found in low, damp woods, bordering on swamps and streams. In Canada its range extends from southwestern Quebec westward throughout southwestern Ontario.

It is a medium-sized tree commonly 50 to 60 ft. in height, and 2 to 3 ft. in diameter. Its wood is similar to that of white oak (*Quercus alba*) and is sold mixed with the other white oaks.

The bark on the trunk is greyish-brown and flaky. It resembles that of the white oak except that it is more deeply fissured and looser. On the small branches it peels off in layers.

The small, crooked branchlets which hang from the larger limbs are very characteristic of the tree. The twigs are smooth and seldom downy. They are coarser, shorter, and rounder in cross-section than those of the white oak.



The winter buds are pale chestnut-brown, $\frac{1}{4}$ in. long, smaller and less pointed than those of the white oak. They are sometimes hairy above the middle, as are those of the scarlet oak, but they are more rounded, or blunter, than the buds of that tree.

The leaves are 5 to 6 in. long and 3 to 4 in. broad. The shape is somewhat like that of the white oak leaf, except that as the notches are not as deep the margin is more wavy. They are thick, shiny, pale green above, and sometimes whitish below.

The acorn is from 1 to $1\frac{1}{2}$ in. long. The cup is thick and encloses about one-third of the nut. The scales sometimes form a slight fringe on the margin of the cup. The inside of the shell is smooth and the kernel is sweet. The acorns are borne singly or in pairs on stalks longer than the leaf-stems, a characteristic feature. They take only one year to mature.

Quercus Muehlenbergii Engelm. **Chinquapin Oak**

Other common names: Yellow oak*, chestnut oak.
French name: Chêne chinquapin.

The chinquapin oak in the forest sometimes reaches a height of 80 to 90 ft. or more, but ordinarily, when growing in the open, it is a medium-sized tree 35 to 40 ft. in height and 1 to 2 ft. in diameter. The crown is composed of many branches, and in shape is narrow with a rounded top. The wood when utilized in Canada is sold with white oak.

The bark is thin, grey, and flaky, and resembles that of the white oak. On the twigs it is reddish-brown and smooth.

The winter buds are chestnut-brown and about $\frac{1}{4}$ in. long. They are smaller than those of the chestnut oak.

The leaves are 4 to 7 in. long, and somewhat like the leaf of the chestnut oak, except that the lobes are more pointed and curved like the teeth of a circular saw. In outline they are half-way between the leaves of the chestnut oak and those of the chestnut proper. The crowding of the leaves towards the ends of the twigs gives the foliage a tufted look.

The nut of the acorn is light chestnut-brown, oval, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, smaller than those of the chestnut oak. The kernel is sweet. The cup is thin, downy inside, and encloses one-half or less of the nut. The scales are knobby at the base of the cup but towards the margin they become thinner and form a slight fringe along the rim.

In Canada this tree is confined to the southwestern part of Ontario, from Niagara westward along the north shore of lake Erie, where it is found on hillsides and bottom lands.

Quercus montana Willd. **Chestnut Oak**

Other common name: Rock oak.
French name: Chêne prin.

The chestnut oak is a small tree 35 to 40 ft. high and 1 to 2 ft. in diameter, but when growing in a crowded forest condition will often reach a greater height. The crown is broad and open.

The bark, which is very dark brown, does not flake but is roughened by deep furrows forming firm, flat-topped ridges on medium-sized trees; on young trees and branches it is smooth.

The twigs are reddish-brown in colour, stout, smooth, and somewhat bitter to the taste when chewed. As compared with those of the white oak they are more ridged.

The winter buds are a light chestnut-brown shade, pointed, and $\frac{1}{4}$ to $\frac{1}{2}$ in. long. They are long in proportion to their width. The margin of the scale is pale, a feature which assists in distinguishing the buds from those of the red oak.

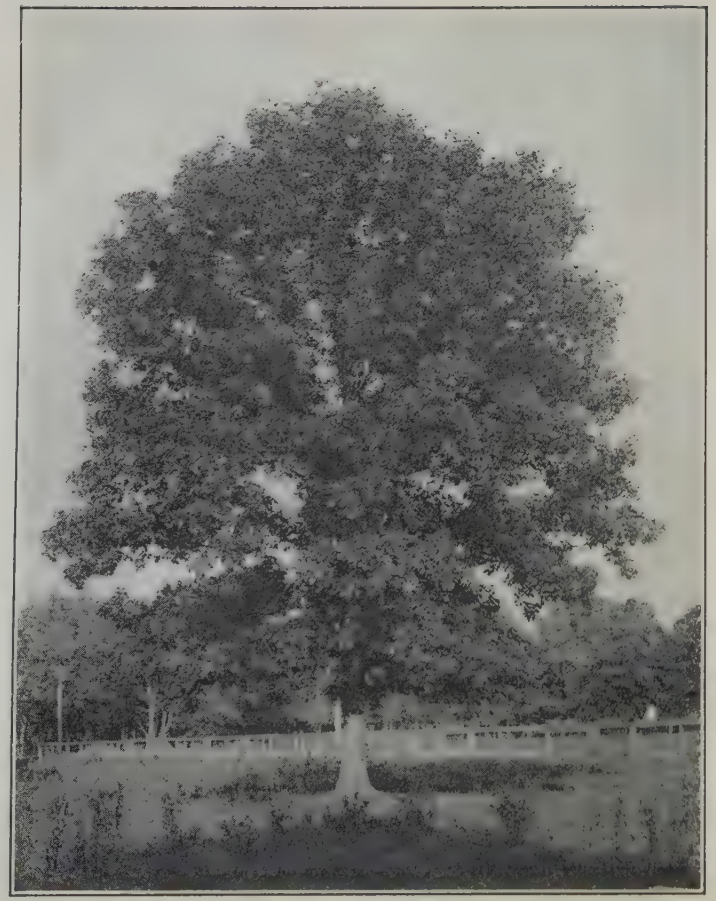


Photo. 11005. *R. H. Campbell.*

Bur oak (*Quercus macrocarpa*)

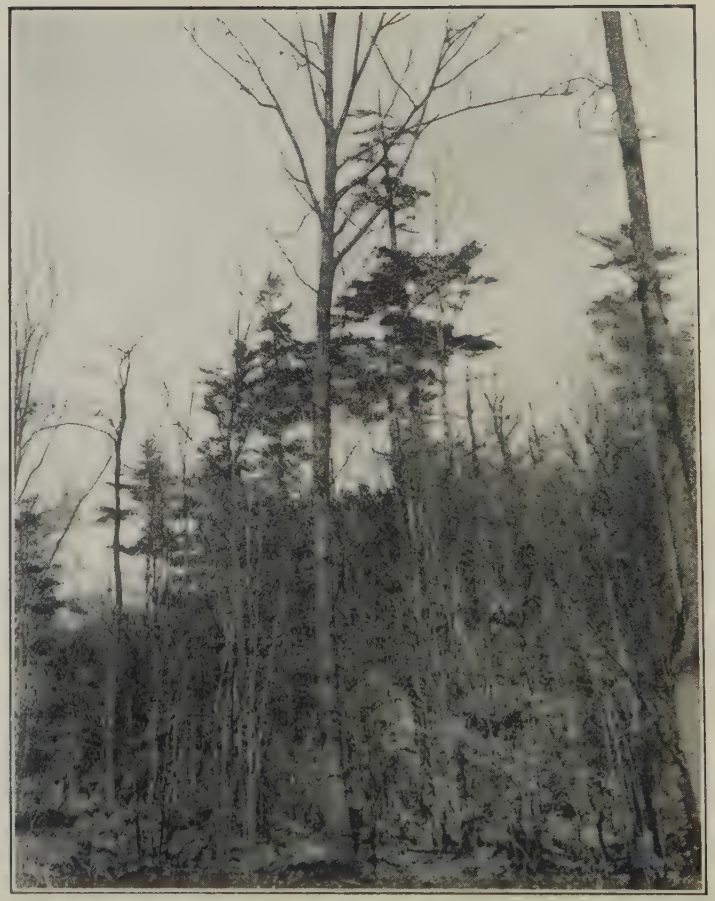


Photo. 8598. *B. R. Morton.*

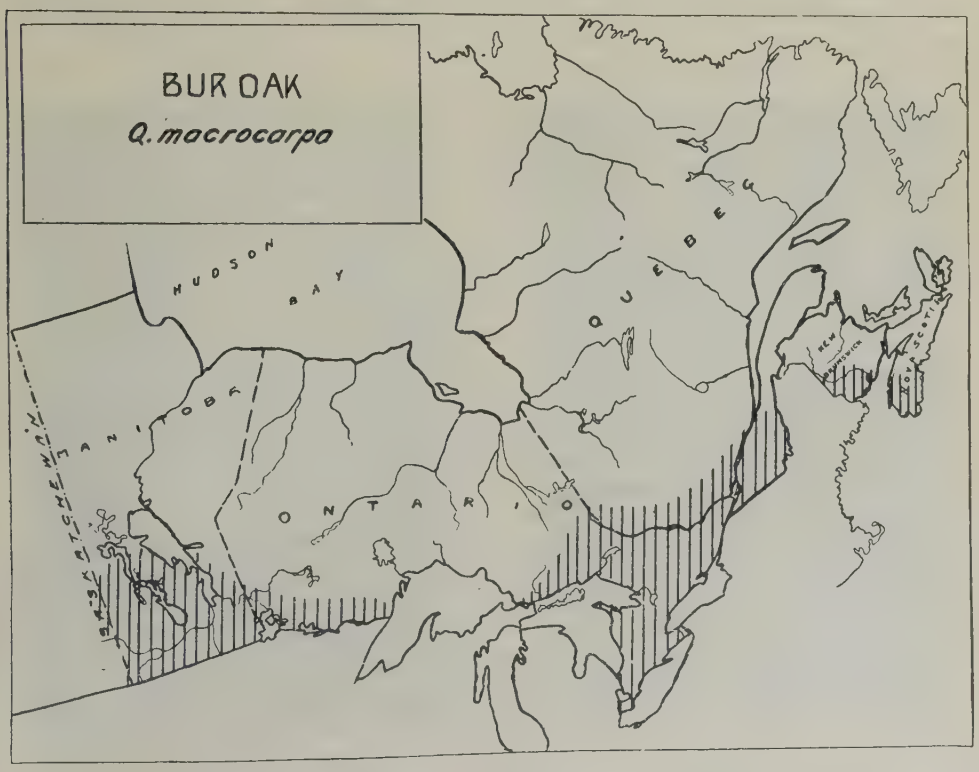
Red oak (*Quercus borealis*)

The leaves are 5 to 9 in. long and 3 to 4 in. wide. In appearance the leaf resembles somewhat that of the chestnut tree. The points on the margin are, however, more rounded, and, the notches being of uniform depth, the outline has more of a wavy than a toothed appearance.

The nut is a bright chestnut-brown, oval, two to three times as long as broad. The kernel is sweet. The cup is thin and top-shaped, and rarely covers more than one-third of the nut. The outside of the cup is knobby.

In Canada the chestnut oak has a very limited range, being found only in that part of the province of Ontario that borders lakes Erie and St. Clair. It grows on well-drained slopes and ridges along with shagbark hickory, red oak, and various other hardwoods.

Neither the chestnut oak nor the chinquapin oak is commercially important in Canada.



Quercus macrocarpa Michx. **Bur Oak**

Other common names: Scrub oak, blue oak*, mossy oak, mossycup oak, overcup oak.

French names: Chêne à gros glands, chêne blanc frisé.

The bur oak does not reach the large size in Canada that it does farther south, being rarely found more than 40 to 50 ft. in height and 1 to 2 ft. in diameter. It has a range in this country from Nova Scotia to Manitoba, and is found farther north and west than any other of the eastern oaks.

The crown is broad and round, and the branches are wide-spreading, except in the northwestern part of its range, where it is often little better than a shrub and is known by the name of "scrub oak."

The tree is confined mostly to the rich bottom lands and sides of valleys.

The bark is brown and flaky, but somewhat firmer in appearance than that of the Eastern white oak.

The bark on twigs that are from three to four seasons old forms corky ridges or wings which remain for several years, disappearing as the branch becomes older. This peculiarity forms one of the best features for distinguishing this tree from the other oaks. The winter buds are $\frac{1}{8}$ to $\frac{1}{4}$ in. long, a light reddish-brown in colour, and frequently have a somewhat flattened appearance as though pressed against the twig.

The leaves vary greatly in size and outline, but nevertheless bear a marked resemblance. The long, deep notches on either side of the main rib, which almost meet and cut the leaf in two, are very characteristic and serve as a good distinguishing feature. They are thick, leathery leaves, bright green and shiny above, and somewhat hairy on the underside.

The acorns are, as a rule, very large, often larger than those of the red oak. The kernel is sweet. The cup is peculiar in that the scales on the margin are elongated and form a distinct fringe.

The wood is similar to white oak and is suited to similar uses.

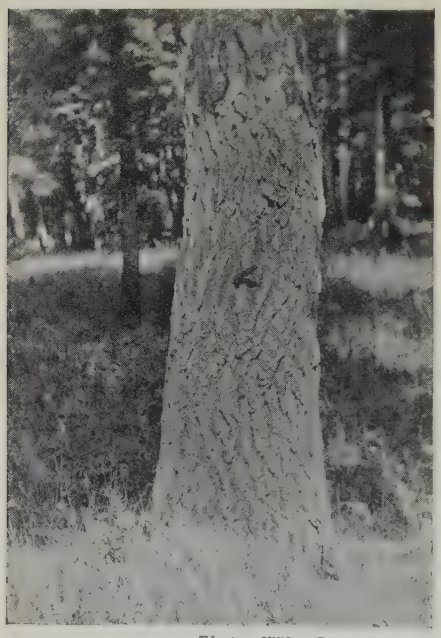


Photo. 8756. *B. R. Morton.*

Bur oak (*Quercus macrocarpa*): trunk and bark

Photo. 8758. *B. R. Morton.*

Red oak (*Quercus borealis*): trunk and bark

Quercus borealis Michx. **Red Oak**

Other common name: Black oak*.
French name: Chêne rouge.

The red oak is found more or less abundantly from Cape Breton in Nova Scotia to Georgian bay in Ontario, and, occasionally, west of this along the north shore of lake Huron and the east shore of lake Superior to the height of land dividing the watershed of the Great Lakes from that of James bay.

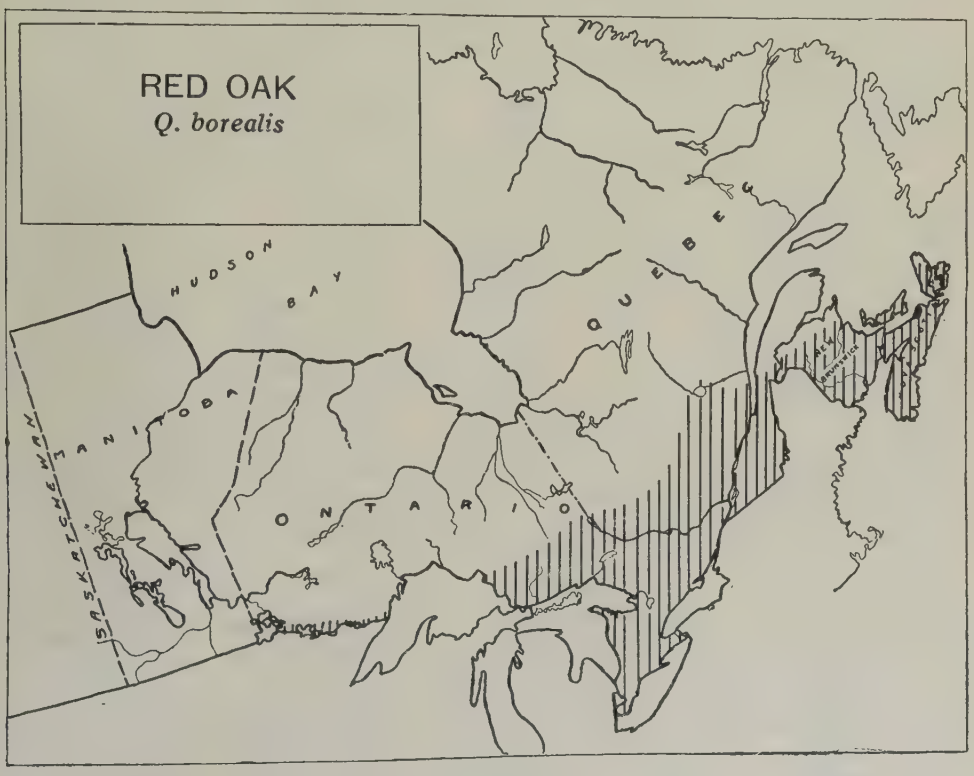
It is our most rapid-growing native oak and does well on a wide variety of soils, but prefers those which are well drained.

It is a large tree 60 to 70 feet or more high and 2 to 3 ft. in diameter, and when grown in the open develops a large, round-topped head composed of stout, far-spreading branches.

The bark on young trees, and even on those of considerable size, is smooth. The limbs and upper part of the trunk are smooth and clean cut.

The winter buds are pointed, $\frac{1}{4}$ in. long, chestnut-brown, and usually smooth, except for a few red hairs at the tip. They resemble the buds of the chestnut oak, but are flatter and have no pale margin to the scales. They have the appearance of being stalked, owing to the bud being narrower at the point of attachment.

The leaves are from 5 to 9 in. long and 4 to 6 in. wide. They have from nine to thirteen lobes—more than most oaks. The lobes are pointed and appear to taper more from the base to the tip than those of the black oak. The notches as a rule extend half way to the midrib. The leaves are dark green and smooth, and in autumn turn a rich red.



The acorns are characteristic and constitute one of the best means of identifying the tree. They are very large, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long. The cup is very shallow and thick. The scales are close and form no fringe at the margin. The kernel is white and bitter. The inside of the shell is somewhat downy. The acorn takes two years to develop.

The wood of the black or red oak group, of which this is the most important species, is not generally so resistant to decay as that of the white oaks. Further, the rays are generally smaller in these oaks than in the white oaks, so that the figure presented by quarter-sawn surfaces is less pronounced in wood of the red or black group than in that of the white oaks. The mechanical properties of timber of good quality of both groups are sufficiently high, however, to ensure adequate resistance to wear and mechanical stresses where the woods are used for the ordinary purposes.

OAKS (*Quercus*)

	BLACK (*Q. velutina*)	RED (*Q. borealis*)	SCARLET (*Q. coccinea*)	PIN (*Q. palustris*)	WHITE (*Q. alba*)	BUR (*Q. macrocarpa*)	SWAMP WHITE (*Q. bicolor*)	CHIN-QUAPIN (*Q. Muehlenbergii*)	CHEST-NUT (*Q. montana*)	POST (*Q. stellata*)	GARRY (*Q. Garryana*)
BARK	Very rough. Inner bark yellow and bitter, will colour the saliva if chewed. See scarlet and chestnut oaks.	Flat, smooth ridges. Trunk up in the branches smooth as a rule. See scarlet oak.	Roughness intermediate between that of the red and black oaks.	Smooth and shiny as a rule.	Flakiness extends to branches 1 in. in diameter. Does not peel off on small branches as with the swamp white oak. See post, bur and chinquapin oaks.	Very corky with ridges along the twigs. Firmer looking on trunk than that of white oak but still quite scaly.	More deeply fissured and looser than on white oak. On small branches peels off in papery layers.	Looks like white oak bark. Scales looser than chestnut oak.	Firm, does not flake. Furrows deeper than those of the black oak, but top of ridges not quite so flat.	Somewhat resembles that of white oak but is darker and rougher.	The only oak native to the western coast of Canada.
TWIGS AND SMALL BRANCHES	Twigs have a bitter taste and colour the saliva if chewed.			Branches have a characteristic habit of growing out horizontally from the trunk. Frequently has many small dead branches attached to the trunk.	Has a bloom on twigs which can be rubbed off. See above, also swamp white and chestnut oaks.	See above.	Twigs smooth, seldom downy. Coarser and shorter than those of white oak, also rounder in cross-section.		Twigs smooth, glossy, and somewhat bitter. More ridged than white oak.	Twigs covered with rough down. Leaf-scars raised on conspicuous projections.	Very hairy.
WINTER BUDS	Completely covered with pale red hair. Larger and more angled in cross-section than those of scarlet or red oaks.	Sometimes have a few red hairs at the tip, otherwise smooth. Somewhat resemble those of the chestnut oak, but are flatter and without pale margin to scales. They have a stalked appearance.	The upper half of bud hairy, the lower half smooth. See swamp white and black oaks.	Very small and pointed.	Larger and more pointed than those of swamp white oak. Blunter than those of chinquapin oak.	Small and, as a rule, slightly hairy. More or less flattened against twig.	Sometimes hairy above the middle but blunter than those of the scarlet oak. See white oak.	Smaller than those of chestnut oak. See white oak.	Pointed and long in proportion to their width. Scales chestnut-brown with paler margin. See red and chinquapin oaks.		Large and hairy.
LEAVES	Lobes pointed. Notches deeper and narrower than those of the red oak. Glossy above.	Lobes pointed. Notches extend half way to the middle rib. 9 to 13 lobes, more than most oaks. Lobes taper more from base to tip than those of black oak.	Lobes pointed. Most deeply notched of any native oak. Lower pair of lobes usually at right angles to the midrib. See pin oak.	Lobes pointed. Resemble those of scarlet oak but smaller.	Lobes rounded Notches fairly deep, most of them $\frac{1}{2}$ in. or over. See swamp white and Garry oaks.	Lobes rounded. Deep notches, one on each side, which almost meet and cut the leaf in two at the middle, are characteristic. Lower face slightly hairy.	Lobes rounded. Not as deeply notched as those of the white oak.	Lobes somewhat pointed. Resemble the leaf of chestnut oak except that the lobes are more pointed. They are curved like the teeth of a circular saw. The crowding of the leaves towards the end of the twig is characteristic.	Lobes rounded. Resemble the leaf of the chestnut tree. The notches being of uniform depth give the leaf a wavy margin.	Lobes rounded and sprawling, the middle pair being the largest. The leaf frequently has a cross-shaped appearance in general outline.	Lobes rounded. Resemble white oak but thicker and more leathery. Hairy beneath.
FRUIT	Inside of acorn shell downy. Scales on cup form a fringe on the margin. Acorn smaller and cup deeper than red oak. Kernel yellow and bitter. Matures in two years.	Inside of shell downy. Cup scales form no fringe at margin. Acorn very large and cup very shallow. Kernel bitter. Matures in two years. See black, scarlet and bur oaks.	Inside of shell somewhat downy. Cup scales form no fringe at margin. Acorn smaller and cup deeper than those of red oak. Kernel white and bitter. Matures in two years.	Inside of shell somewhat downy Acorn wider than long, about $\frac{1}{2}$ in. long. Dark brown with stripes radiating from tip. Kernel bitter. Matures in two years.	Inside of shell smooth. Cup scales have a warty appearance and form no fringe at the margin. Cup shallow. Kernel sweet. Matures in one year.	Inside of the shell smooth. Scales on cup form a distinct fringe which is longer than on any other native oak. Acorn and cup very large, often larger than those of red oak. Kernel sweet. Matures in one year.	Inside of the shell smooth. Sometimes has a slight fringe on margin of cup, borne on a stalk longer than the leaf stems. Kernel sweet. Matures in one year.	Inside of the shell smooth. Acorn smaller than that of the chestnut oak. Cup encloses one-half or less of the nut. Kernel sweet. Matures in one year. See chestnut oak.	Inside of the shell smooth. Acorn 2 to 3 times as long as broad. Cup encloses one-third or less of the nut. Kernel sweet. Matures in one year. See chinquapin oak.	Inside of the shell smooth. Kernel sweet. Matures in one year.	Acorn large. Cup hairy. Matures in one year.

Quercus velutina Lam. **Black Oak**

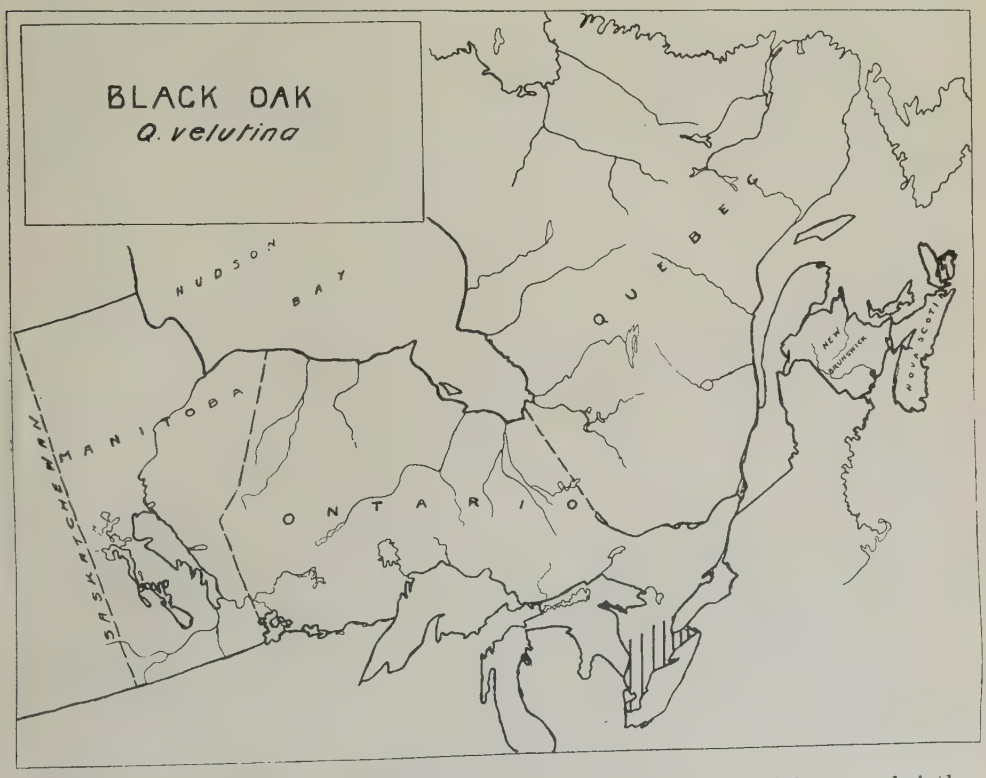
Other common names: Yellow oak*, yellow-barked oak, red oak*.
French names: Chêne des teinturiers, chêne noir.

The black oak is confined to southwestern Ontario, where it is found growing on the poorer gravelly and sandy soils.

It is a large tree 60 to 70 ft. high and 2 to 3 ft. in thickness through the trunk. Growing in the open it develops a crown sometimes tall and narrow, and at other times wide and spreading. When sawn into lumber it is sold as red oak.

The bark is a very dark brown, almost black on old trees. It is very deeply furrowed and considerably rougher than that of either the red oak or the scarlet oak. The yellow, bitter, inner bark, which will colour the saliva if chewed, is a good distinguishing feature of this tree. The reddish-brown twigs will also colour the saliva.

The winter buds are brown and $\frac{1}{8}$ to $\frac{1}{4}$ in. long. They are larger and more angled in cross-section than those of the scarlet oak or red oak and are completely covered with pale red down.



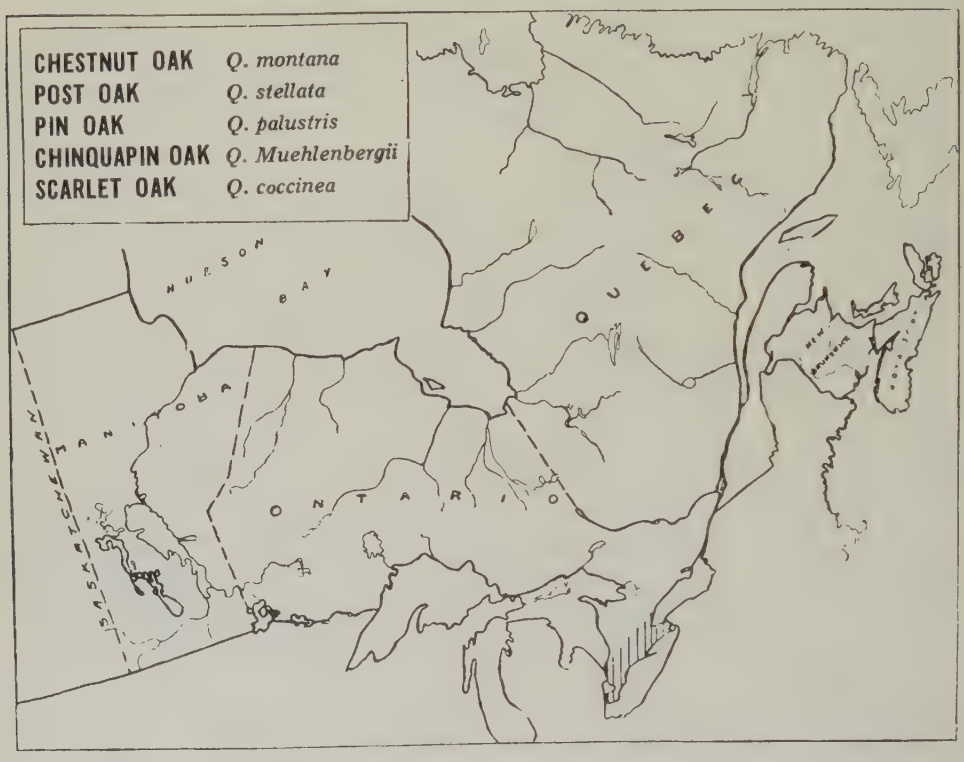
The leaves are 4 to 6 in. long and 3 to 5 in. wide. The lobes are bristle-pointed and the notches are deep. The notches are deeper and the lobes narrower than those of the red oak. The indentations might be described as more circular and the lobes less wedge-shaped than those of the red oak. The mature leaf is dark green and the upper surface glossy.

The acorn is smaller and the cup is deeper than are those of the red oak. The cup embraces one-third to one-half the nut and the scales form a distinct fringe on the margin. The inside of the shell of the nut is downy, and the kernel is yellow and bitter. The acorn takes two years to mature.

Quercus palustris L. **Pin Oak**

Other common names: Water oak, swamp oak.
French name: Chêne des marais.

The pin oak, in Canada, is confined to the southwestern part of Ontario, from Niagara westward in the counties bordering on lake Erie and the Detroit river, where it is frequently found growing in damp positions, such as the borders of swamps and streams.



It is a tree 50 to 60 ft. high and 1 to 2 ft. in diameter. The trunk is tall and straight, and extends well up into the crown. Young trees growing in the open are very graceful and readily distinguished by their characteristic habit of sending their branches out horizontally from the trunk. The lower branches sometimes droop slightly. The name "pin oak" is derived from the many tiny, slender branchlets which stand out from the branches, which at a distance have a pin-like appearance. The wood when utilized in Canada is sold as red oak.

The bark is smooth, somewhat shiny, and steel-brown in colour.

The winter buds are very small, $\frac{1}{8}$ in. long, pointed, and chestnut-brown.

The leaves are 4 to 6 in. long, and resemble much those of the scarlet oak, but are smaller. The incisions are deep, broad, and rounded. The lobes are pointed and bristle-tipped.

The acorn has a very small cup with thin scales. The nut is less than $\frac{1}{2}$ in. long, and is wider than long. It is light-brown and striped. The kernel is bitter and the inside of the shell is somewhat downy. The acorn takes two years to develop and ripen.

Quercus coccinea Muench. **Scarlet Oak.**

Other common names: Black oak*, red oak*, Spanish oak.
French name: Chêne écarlate.

The scarlet oak in Canada is confined to the southwestern part of Ontario, from Toronto westward, where it is found growing on sandy and gravelly lands along with other oaks. It is a tree 40 to 50 ft. in height and 1 to 3 ft. in diameter. Growing in the open, it forms a narrow, rounded, more or less open crown. Its lumber is sold with that of the other black or red oaks.

The bark of the trunk is dark-brown and shallow-fissured; in roughness it has been described as intermediate between that of the red and the black oaks. The inner bark is yellowish, but not bitter as is that of the black oak.

The winter buds are $\frac{1}{8}$ to $\frac{1}{4}$ in. long and dark reddish-brown. The upper half of the bud is covered with hair, the lower half is smooth. In this latter respect the buds somewhat resemble those of the swamp white oak, but can be distinguished by the more pointed tip of the scarlet oak buds.

The leaves are 3 to 6 in. long and 2 to 5 in. broad. The lobes are pointed and bristle-tipped. The notches or indentations are very wide and deep—deeper than those of any other native oak—and give the foliage a very ragged appearance. The lower pair of lobes are usually at right angles to the midrib.

The acorns are $\frac{1}{2}$ to 1 in. long, smaller than those of the red oak. The cup, too, is deeper than that of the red oak. The scales do not form a fringe at the margin. This aids in distinguishing it from the black oak. The inside of the shell is somewhat downy and the kernel is white and bitter. It takes two years for the acorn to mature.

THE ELMS

Sixteen species of elm (*Ulmus*) are recognized throughout the world. Six are known to occur in North America, and three of these are native to Canada. Several exotic species have been brought to this country for ornamental planting, of which the two most common are the English elm (*Ulmus procera*) and the Scotch elm (*Ulmus glabra*). They have larger fruit than the native species.

The wood of the elms is generally heavy, hard, and tough. Its mechanical properties give it considerable importance. Taking one year with another, elm has an average rank of fourth among Canadian hardwoods with respect to quantity used annually. The timber is extensively used in slack cooperage for staves, hoops, and heading, in furniture, boxes, veneer and such veneer products as baskets and cheese boxes, vehicle stock, agricultural implements and machinery, and hockey sticks.

The elms belong to the same group as the hackberry (*Celtis occidentalis*), a comparatively rare tree, which might be mistaken for an elm. They can be readily separated by their fruit, which in the case of the hackberry is berry-like, and in the case of the elm consists of small flat seeds surrounded by a thin, papery wing. The fruits of the Canadian species of elm fall in spring or early summer; those of the hackberry remain on the tree during the entire season.

Ulmus fulva Michx. **Slippery Elm**

Other common names: Red elm, slippery-barked elm, soft elm, budded elm.
French names: Orme rouge, orme gras, orme fauve.

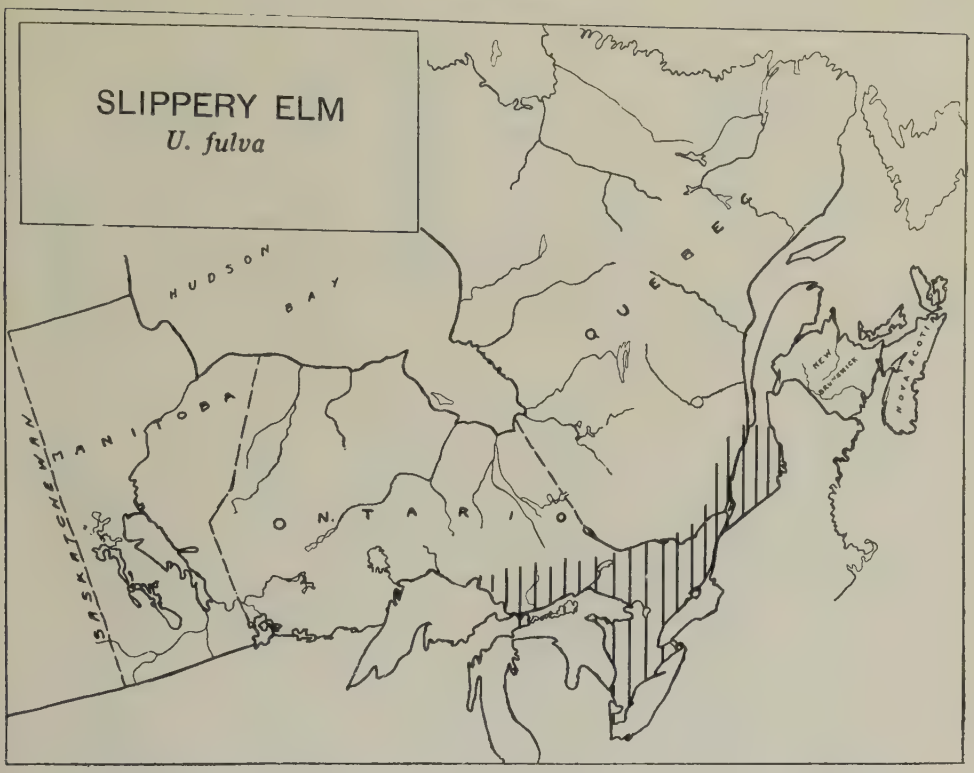
The slippery elm averages 50 to 60 ft. in height and 1 to 2 ft. in diameter. It develops a crown similar to that of the white elm, and, except when it has grown in the forest, the trunk is comparatively short.

Photo. 10995. *R. H. Campbell.*

White elm (*Ulmus americana*)

Photo. 11002. *R. H. Campbell.*

Rock elm (*Ulmus racemosa*)



It prefers rich, well-drained soil and is found along the banks of streams. Its range in Canada is confined to the St. Lawrence valley, not extending north or west of lake Superior.

The bark is greyish-brown and rough. The white layer which is characteristic of the white elm is not present. The fragrant, mucilaginous inner bark, from which it derives one of its common names, " slippery," is a peculiarity by which it is distinguished from the white or rock elms.

The twigs at first are green but later become ashy-grey. They are stouter than those of the white elm and very much more mucilaginous. The scars left by the leaves are more conspicuous.

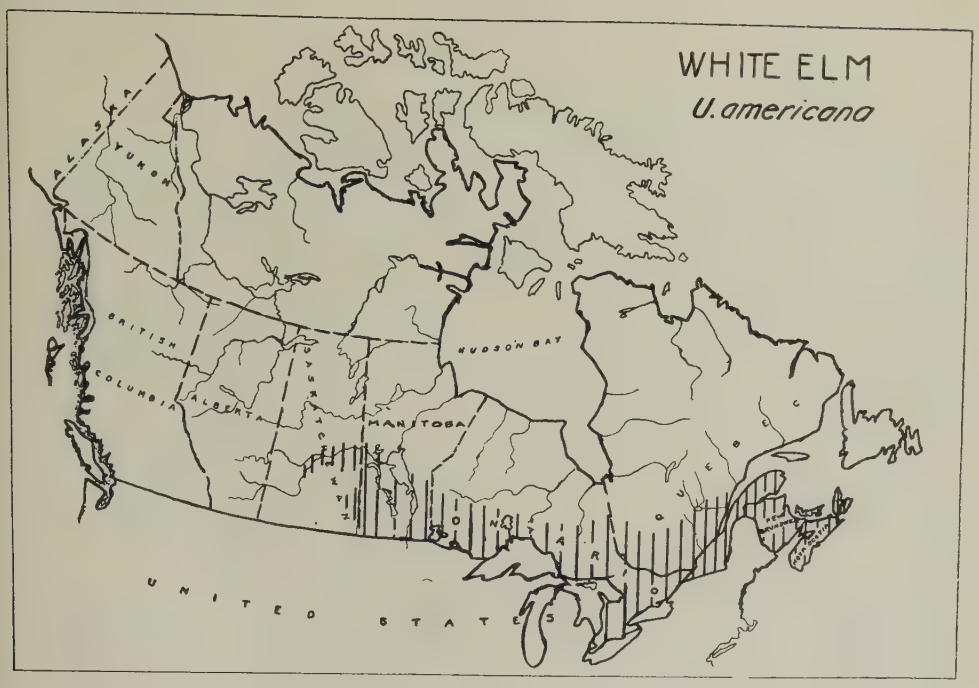
The winter buds differ considerably from those of the other elms, and are one of the easiest means of distinguishing it. They have a heavy covering of reddish-brown hair, while those of the rock elm are as a rule only fringed with hair along the margin of the scales, and those of the white elm are smooth. They are larger, rounder, and softer looking than those of the latter species.

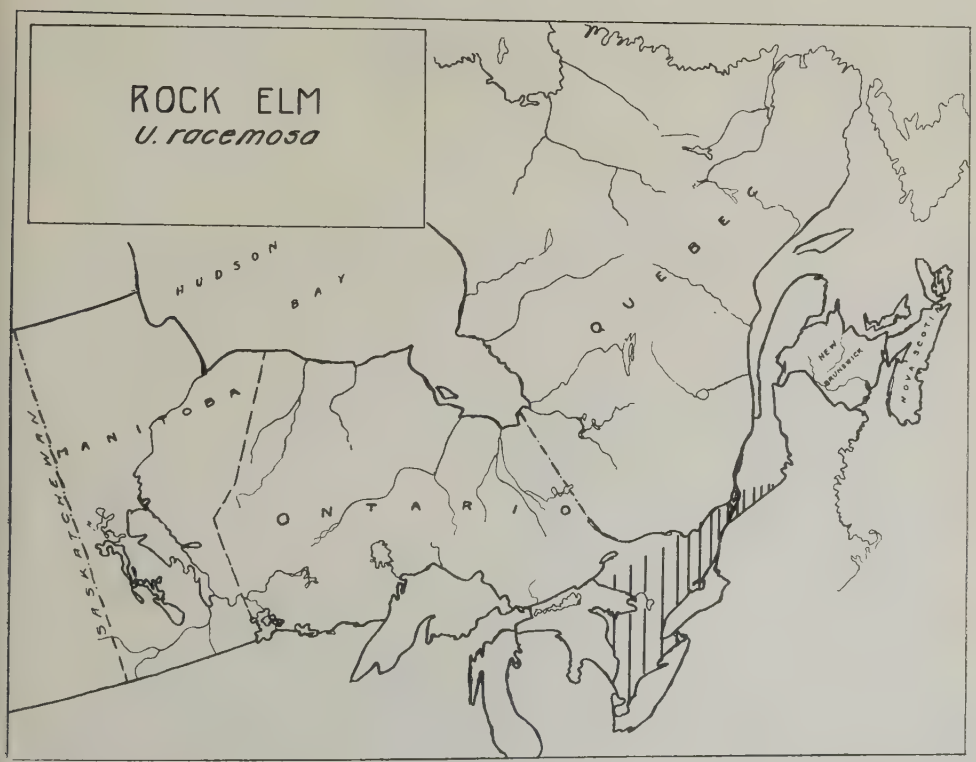
The roughness of the leaves is another feature by which this tree is readily distinguished from the other elms; they are not only rougher to the touch but rough whichever way they are rubbed. Those of the white elm are rough only one way. The leaves of the red elm are, on the whole, larger than those of the other elms.

The wing surrounding the seed is larger and somewhat more nearly circular in outline than that of the white elm. The margin is hairless while that of the white elm has a hairy fringe.

Lumber from the slippery elm is ordinarily not separated from that of the white elm (*U. americana*).

	ELMS (*Ulmus*)			HACKBERRY (*Celtis*)
	WHITE ELM (*Ulmus americana*)	ROCK ELM (*Ulmus racemosa*)	SLIPPERY ELM (*Ulmus fulva*)	HACKBERRY (*Celtis occidentalis*)
BARK	A cross-section through a ridge of the bark will show an occasional whitish layer.	Forms corky ridges on the small branches and twigs. On trunk resembles that of white elm but without the whitish layers.	Inner bark very slippery or mucilaginous.	Forms wart-like ridges on an otherwise comparatively smooth trunk.
TWIGS	Smooth and slender. Only slightly slippery when chewed. New twigs smoother, finer, and more glossy brown than those of rock elm.	Hairy. Often covered with irregular, corky ridges. Not slippery when chewed.	Hairy. Coarser and with leaf-scars more conspicuous than those of white elm. Slippery when chewed.	Pith chambered, in all the elms it is solid. Often roughened by wart-like projections. Wood when moistened has a greenish tinge.
WINTER BUDS	Smooth and narrower than those of rock elm.	Fringed with hair. Larger than those of white elm. More conspicuous margin to scales.	Covered with reddish-brown hair. Larger, rounder, and softer looking than those of white or rock elm.	Point somewhat flattened. Scales have a dark margin. Terminal bud is lacking.
LEAVES	4 to 6 in. long. Soft, hairy on the underside and rough above.	Slightly smaller, as a rule, than those of white elm. Slightly rougher above than beneath.	Larger and rougher than the other elms. Rough to the touch on both sides and whichever way it is rubbed.	Like those of elm but comparatively free of teeth. Very rough.
FRUIT	Hairy fringe on the seed wing which is notched at one end.	Hairy fringe but notch not so deep as with white elm. The seed is larger in proportion to the size of the wing than in the other elms.	No hair on the margin.	A dark purple, berry-like fruit.


WHITE ELM
U. americana
ALASKA
YUKON
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
HUDSON BAY
ONTARIO
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA
UNITED STATES


ROCK ELM
U. racemosa
HUDSON BAY
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA

Ulmus americana L. **White Elm**

Other common names: American elm, water elm, swamp elm, rock elm*.

French names: Orme blanc, orme d'Amérique.

The white elm is one of our largest and most stately trees, having a height of 50 to 125 ft., and a diameter of 2 to 7 ft. In the forest it rises to a considerable height before branching, but growing in the open field it divides comparatively close to the ground into two or three main branches, which gradually spread out forming a high triangular or fan-like crown with branchlets more or less drooping.

It thrives best in rich, moist, well-drained soils, and is found growing singly or in mixture with other hardwoods. Its range in Canada extends from Nova Scotia to Saskatchewan, south of the height of land dividing the watershed of Hudson bay from that of the Great Lakes.

The bark is dark grey and roughened with broad, flat-topped, flaky ridges. Seen from the side of a ridge it shows an occasional layer of whitish bark. This characteristic distinguishes it readily from the red, or slippery, elm.

The twigs are brownish, slender, smooth, and slightly mucilaginous if chewed.

The winter buds are light reddish-brown, conical, and pointed. They are smooth and have not the hairiness of the slippery elm.

The leaves are from 4 to 6 in. long, and uneven-based, giving them a lop-sided appearance. The underside is soft and hairy. The red elm, on the contrary, is rough to the touch. The veining is coarse.

It flowers in April and seeds abundantly in May and June.

White elm is one of the most generally useful hardwoods in America, and is valued chiefly on account of its size, strength, and toughness. It is used in manufacturing slack staves, hoops, and heading; furniture, boxes, veneer baskets, cheese boxes, and other veneer products; vehicle stock (especially wagon hubs); framework for agricultural implements and machinery; hockey sticks, and in dock construction.

Ulmus racemosa Thomas **Rock Elm**

Other common names: Cork elm, hickory elm, cork-barked elm, white elm*.

French name: Orme liège.

The rock elm averages 50 to 60 ft. in height and about 2 ft. in diameter. The trunk is slender and erect, and the branches, coming off at a wider angle from all sides than those of the white or slippery elms, form a somewhat round-topped crown.

Its general shaggy appearance, and the fact that even the small branchlets and twigs have corky ridges growing from their sides make it easy to distinguish this species with certainty from the other elms.

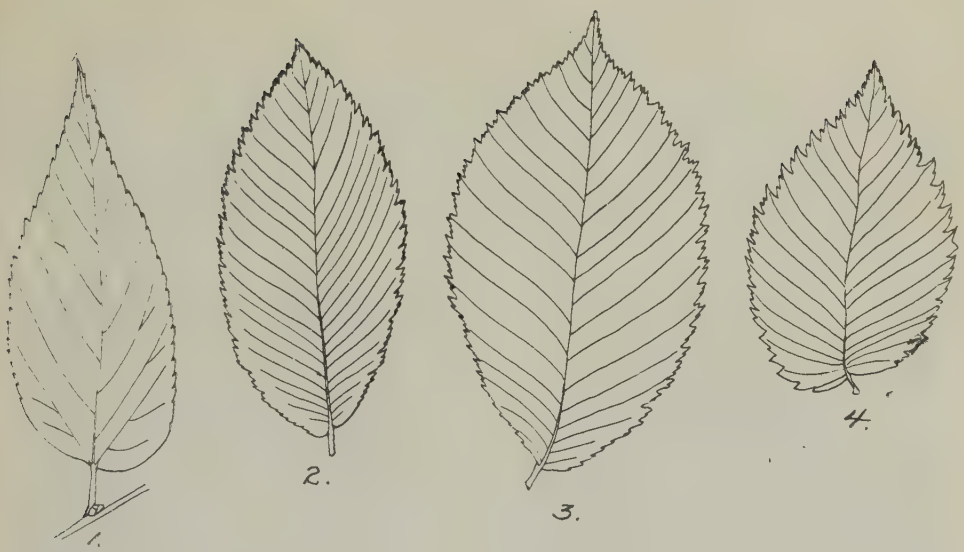
The winter buds are somewhat larger and narrower than those of the white elm and the leaves are, on the whole, smaller. Like the leaves of all elms they are unequal at the base.

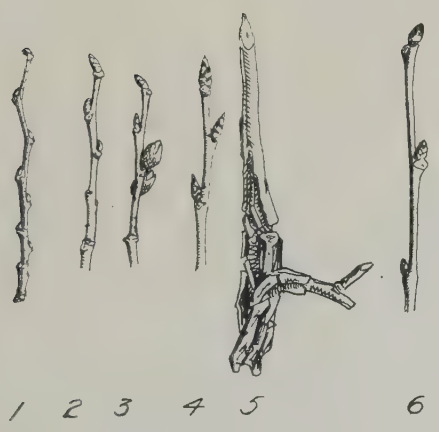
The wing of the fruit is hairy. The seeds are greater in proportion to the size of the wing than those of other elms.

The rock elm grows on a wide range of soils, from dry and gravelly or heavy clay soils to the rich, moist banks of streams. It is found solitary or mixed with other hardwoods.

In Canada it is confined to the southern parts of Quebec and Ontario and probably does not extend north beyond the Ottawa river or Georgian bay.

The wood of this elm is the hardest, toughest, and strongest of the American species. It is preferred to white elm for framework in pianos, heavy machinery, shipbuilding, vehicle stock and hockey sticks. Otherwise the two species have similar uses.





ELM AND HACKBERRY LEAVES, FRUIT, AND TWIGS

LEAVES.—1 Hackberry (*Celtis occidentalis*). 2 Rock elm (*Ulmus racemosa*). 3 Slippery elm (*Ulmus fulva*). 4 White elm (*Ulmus americana*).

FRUIT.—1 White elm (*Ulmus americana*). 2 Rock elm (*Ulmus racemosa*). 3 Slippery elm (*Ulmus fulva*).

TWIGS.—1 Hackberry (*Celtis occidentalis*). 2 and 3 White elm (*Ulmus americana*). 4 and 5 Rock elm (*Ulmus racemosa*). 6 Slippery elm (*Ulmus fulva*).

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THE HACKBERRY

Fifty or more species of hackberry (*Celtis*) are found throughout the world in both the north temperate and tropical regions. They are mostly shrubs and small trees of no economic importance. They belong to the same group as the elms and resemble them in many respects. The wood is like that of the elm except that it is somewhat heavier, harder, and more brittle. In cross-section it shows the zigzag lines of minute pores which is the characteristic marking of this group.

Photo. 9383. *B. R. Morton.*

White elm (*Ulmus americana*): trunk and bark

Photo. 6061. *B. R. Morton.*

Hackberry (*Celtis occidentalis*): trunk and bark

Celtis occidentalis L. **Hackberry**

Other common name: Bastard elm.
French names: Micocouiller occidental, orme bâtard.

The hackberry is a tree 25 to 35 ft. high and 1 to 2 ft. in diameter. It forms a large, rounded crown, but often flat-topped and spreading. This characteristic, together with its slightly drooping lower branches and elm-like leaves, often leads one at first glance to mistake it for an elm.

It prefers rich, moist soils but will grow on dry, gravelly sites. It is confined in Canada to the valley of the St. Lawrence from Montreal westward through southern Ontario. It is local in its distribution; and nowhere in Canada is it very common and for this reason it is little known.

While this tree at a short distance is easily mistaken for an elm, a close examination shows many differences. The bark of the trunk, instead of being flaky as in the elm, is covered with wart-like ridges which often extend well up into the branches.

The pith of the twigs is white and chambered, while in the elms it is solid. The wood when moistened has a slightly greenish tinge not visible in that of the elm.

The buds, which are chestnut-brown, flattened, pointed, and somewhat hairy, generally have a dark edge about the margin of their scales. The bud at the end of the twig is lacking.

The leaves much resemble those of the elm, but are more taper-pointed and comparatively free of teeth. They are about 3 in. long, deep green in colour, and rough to the touch.

The fruit is berry-like, reddish to dark purple, the size of a currant, and contains a stone. It ripens in September and is sweet and edible.

The wood of the hackberry is very similar to that of the rock elm. The two are difficult to separate when sawn into lumber and when hackberry is utilized it is usually sold mixed with either rock or white elm.

THE MULBERRY

Seven species of mulberry (*Morus*) are recognized, of which two at least occur in North America; of these two one grows in Canada. Several of the species are cultivated for their leaves, which furnish the principal food of the silkworm, and for their fruit, which is edible. Perhaps the most widely known species is the white mulberry (*Morus alba*) which all over the world has escaped from cultivation and now grows wild. It is occasionally found growing wild in southern Ontario, but can be readily distinguished from the native species by its lighter-coloured twigs, smaller winter buds, and white, instead of red, berries.

The wood of the mulberries is of high technical value, hard, and durable. In some parts of the United States the mulberry is planted for the purpose of producing fence-posts.

For illustration of the twigs and winter buds of this species, see the first of the plates "Miscellaneous Twigs" at the end of this volume.

Morus rubra L. **Red Mulberry**

Other common names: Black mulberry, mulberry.
French names: Murier rouge, murier sauvage.

The red mulberry is found growing naturally in Canada only in the Niagara peninsula, and westward to the Detroit river, but is nowhere a common tree.

It is small, 15 to 30 ft. in height, when grown in the open. The trunk is short and the crown is broad, round-topped, and compact. It is sometimes planted on lawns and in gardens as an ornamental tree and for the sake of its berries.

The bark is reddish-brown and divides into long plates or strips, which are somewhat flaky. It resembles that of the white cedar but is firmer and not so stringy or fibrous.

The twigs are slender, reddish, and have a somewhat zigzag habit of growth. When cut on a warm day early in the spring they give out a milky juice with a rather sweetish taste.

The leaf-scars are distinctly marked with a more or less closed ring of raised bundle-scars. This is characteristic of all the mulberry species.

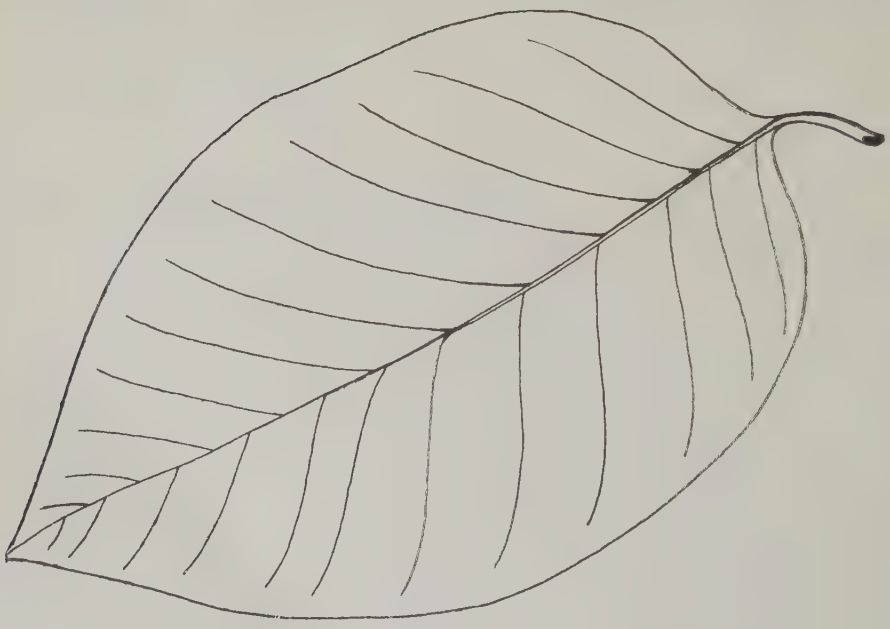
The winter buds are about $\frac{1}{4}$ in. long, stout, greenish to brown, shiny, sometimes slightly flattened, and stand out well from the twig.

The leaves are 3 to 5 in. in length, broadly oval, but variable in form; some are entire and others have one, two, or even five lobes. They are thin, firm, dark green above, and downy beneath. The margins are saw-toothed.

The fruit resembles a blackberry, about 1 in. long, attached to a stem about one-quarter as long. It is red when full-grown but dark purple when ripe. It is sweet, juicy, and edible, and is eagerly devoured by birds, and for this reason the tree is sometimes planted near gardens to distract the birds' attention from other more valuable small fruits.

The wood is bright orange-brown in colour and is fairly hard and heavy. It is very durable and is sometimes used for posts, cooperage, and boat-building in the Ohio valley where it is most abundant. It is not an important tree in Canada.

Red Mulberry (*Morus rubra*): leaf and fruit



Magnolia (*Magnolia acuminata*): leaf

Photo. 11014. *R. H. Campbell.*

Hackberry (*Celtis occidentalis*)

THE MAGNOLIA

Twenty species of magnolia (*Magnolia*) are found throughout this continent and eastern Asia. Seven are native to North America, and only one occurs naturally in Canada. Most of them are of little economic importance except for decorative planting. For this purpose many horticultural varieties have been produced. The Asiatic species, while not as large trees as the American, have larger and more showy flowers.

Magnolia acuminata L. **Cucumber Tree**

Other common names: Magnolia, pointed-leaved magnolia, cucumber magnolia.

French name: Magnolier à feuilles acuminées.

The cucumber tree is rare in Canada, and, like many other trees in this country, is to be found only in the southwestern portion of Ontario in the counties bordering on lake Erie.

Farther south, when growing under favourable conditions, it sometimes becomes a large tree, 80 to 90 ft. high and 2 to 3 ft. in diameter. Ordinarily, however, it is much smaller.

Papaw (*Asimina triloba*): leaf and fruit

Tulip Tree (*Liriodendron Tulipifera*): leaf and fruit-cone with carpels partly fallen away

When not crowded the shape of the tree is conical with a wide base. The bark of the trunk is roughened by flaky ridges of greyish-brown colour.

The twigs are slender, brown, shiny, smooth, and aromatic. The winter buds are very blunt and are covered with silky hair. The end bud of the twig is several times larger than those along the side.

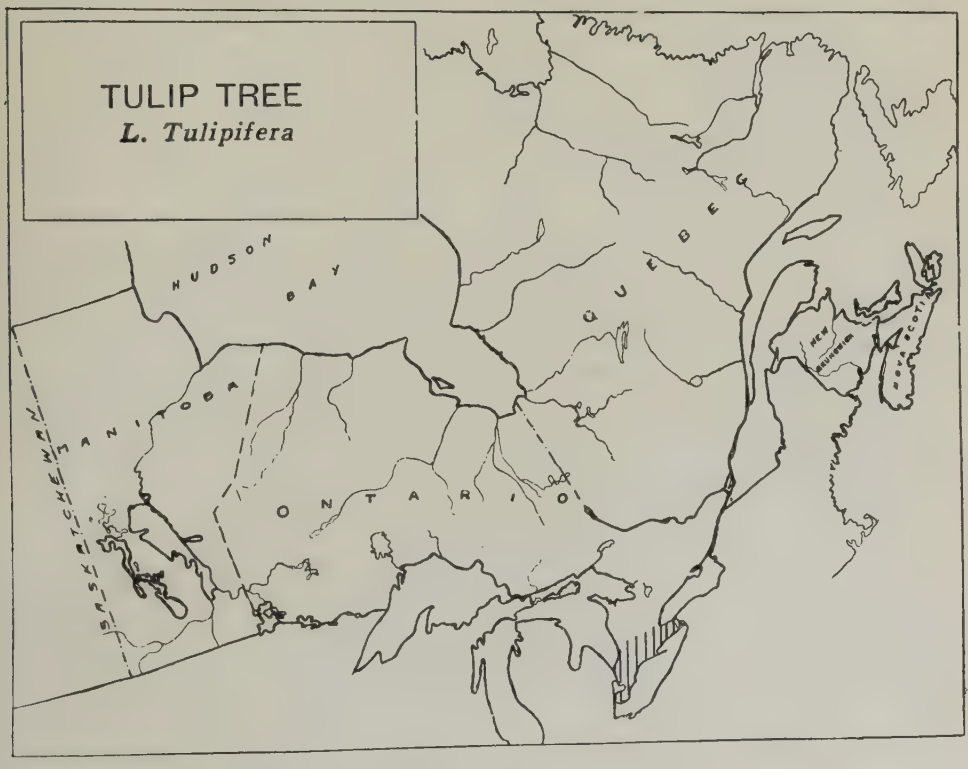
The leaves are 6 to 10 in. long and 4 to 6 in. broad. In outline they are a pointed oval. They are thin, smooth on top, and slightly downy beneath. They are widely distributed along the branch, not clustered towards the end. They are numerous and produce a heavy shade.

The flowers are about 3 in. wide, yellowish-green, bell-shaped, composed of six petals, and stand upright on the ends of the twigs.

The fruit is usually oblong and curved, and, when green, resembles a cucumber in appearance. When ripe it is dark red in colour and the various sacs or pockets open, releasing the flattened, orange-red seed each contains. The seeds hang suspended by fine white threads.

The wood is light-coloured and moderately heavy. In the United States, where the timber reaches its best size, it is largely used in automobile body work, boxes and crates, framing, millwork, built-up stock, and veneers.

For illustration of the twigs and winter buds of this species, see the second of the plates "Miscellaneous Twigs" at the end of this volume.



THE TULIP TREE

Only two species of tulip tree (*Liriodendron*) are recognized. One is a small tree or shrub in China; the other is our native one, which in the United States is an important timber tree, but in Canada is of limited distribution. The tulip trees were much more widely distributed at one time, for fossil remains of them are found both on this continent and in Europe.

Liriodendron Tulipifera L. **Tulip Tree**

Other common names: Yellow poplar*, whitewood*.
French name: Tulipier.

The tulip tree has a very limited range in Canada, being found growing naturally only in the southern peninsula of Ontario, from Niagara westward to the Detroit river.

It is a tall, stately tree 50 to 70 ft. in height, with diameter of 2 ft. or over, sometimes reaching the great height of 175 feet. The branches are comparatively short; those near the top usually ascending, and those near the bottom declining, make a very open, irregular crown.

The bark of the trunk is thick, brown, closely furrowed, and has the tight-fitting appearance of the white ash bark. The inner bark is bitter.

The twigs are slender, reddish-brown, and smooth. They have an exceedingly bitter taste but a rather pleasant aromatic smell. The winter buds are long and blunt at the tip with the terminal or end bud of the twig much larger and longer. They are reddish-brown and covered with a bloom. The leaf-scar is circular.

The leaves are 5 to 6 in. long and of such a peculiar shape that they are readily distinguished from those of any other native tree. The end or top is abruptly squared or slightly notched as though it had been clipped off.

The flowers are tulip-like, 3 or 4 in. across and composed of six, greenish-yellow petals, touched with orange inside the cup. They open in May and it is from them the tree derives its common name.

The fruit is a peculiar, erect cone 2 to 3 in. long, composed of many dry, flat-winged seed-cases, which are attached to a central spike. These gradually drop off after the seeds ripen, often leaving the central axis, with the lower scales attached, to remain on the tree during the winter.

Owing to the comparative scarcity of this tree in Canada, it is of minor commercial importance from the standpoint of lumber production. The wood has valuable physical qualities similar to those of basswood. It is rather light and soft, and of even texture, usually without figure. It is one of the most generally useful woods, being easily worked and nailed and taking paint and enamel readily. It is used for steam-heat work and for vehicle bodies, automobiles, cabinet work, and similar purposes. It is a valuable core-stock and is prized for its stability as a soft hardwood obtainable in large widths. It is used to some extent in ornamental carvings.

For illustration of the twigs and winter buds of this species, see the second of the plates "Miscellaneous Twigs" at the end of this volume.

THE PAPAW

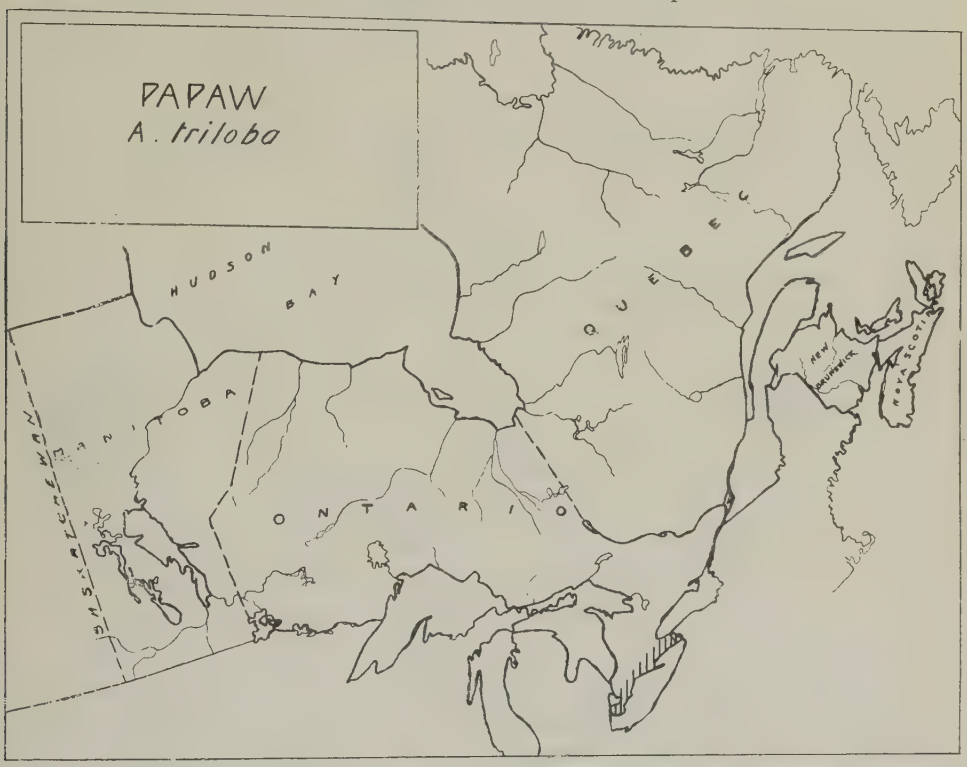
The papaws (*Asimina*) belong to a large tropical or sub-tropical family. Six species are known. In North America one reaches tree size and extends as far north as southern Ontario, the others are shrubs, found in the southern Atlantic and Gulf states of the United States. They are of no commercial importance.

Asimina triloba Dunal **Papaw**

Other common names: Custard apple, false banana, jasmine*.
French names: Asiminier trilobe, faux-bananier, jasminier*.

In Canada the papaw is confined to the counties in southern Ontario bordering on lake Erie, where it grows on deep, moist soils. It is not very common and when found is usually in the form of a shrub, although under favourable conditions farther south it gets to be 30 ft. tall. For the most part it forms the undergrowth in rich woodlands.

The bark is smooth, shiny, dark brown, and blotched with grey spots. The inner bark is fibrous and tough. The twigs are slender and spreading, tinged with red, and marked with little grooves running lengthwise. The winter buds are small, brown, hairy, and slightly tapered at the top.



The leaves are 8 to 12 in. long and 3 to 4 in. wide, the widest part being above the middle. The margin is toothless and the upper surface is smooth and dark green. The stems are very short and stout. The leaf is very similar to that of the magnolia or cucumber tree.

The fruit is characteristic. It is 3 to 5 in. long, oblong in shape, but sometimes irregular. The flesh is yellow, soft, edible, and much prized by those who have acquired a taste for it. The seeds are flat, wrinkled, and about 1 in. long and $\frac{1}{2}$ in. broad.

The wood has neither technical nor commercial value.

THE SASSAFRAS

There is only one species of Sassafras (*Sassafras*) known, and it is found in China and the eastern portion of North America. It is nowhere abundant enough to be of economic importance, although it is widely distributed over its range. The wood is a rich brown in colour, soft, durable, and of high quality.

Sassafras variifolium (Salisb.) Ktze. **Sassafras**

Other common names: Sassafrax, saxifrax.
French name: Sassafras.

The Canadian range of this tree is limited to southern Ontario, from the vicinity of Toronto westward to the southern end of lake Huron.

It is a tree 30 to 40 ft. in height and 12 to 18 in. in diameter, sometimes larger, but on dry, sandy sites is often a shrub growing in thickets.

Sycamore (*Platanus occidentalis*): leaf and fruit

Sassafras (*Sassafras variifolium*): leaf and fruit

The crown is flat, open, irregular, and composed of stout branches which are more or less contorted. The base of the tree is frequently surrounded by a thicket of young shoots that have sprung up from the roots.

The bark is thin, but cut by fairly deep grooves into prominent ridges, which on large trees are broken into blocks by transverse cracks. The bark, twigs, and roots all have a peculiar, strong aromatic taste and smell which enable one to identify the tree at once.

The twigs are fairly stout, reddish-brown, smooth, and shiny, as a rule. They are irregular in their branching habits. The winter buds are large, prominent, oval-pointed, and greenish. Those on the side stand well out from the twig.

The leaves are 4 to 6 in. long, dull yellowish-green, smooth, and rather thick. They have three distinct forms, one oval-tapered at both ends, another somewhat similar, with the addition of a lobe at one side like the thumb of a mitten, and a third three-lobed, like a mitten with a thumb on each side. All these forms may be found on the same tree.

The fruit is berry-like, small, oval, blue, soft, and single-seeded. It is borne on a fleshy, cup-shaped stem.

The sassafras is sometimes sawn into lumber in Canada and used for cabinet work. The wood is soft and durable, has a pleasing grain and figure, and is pleasantly aromatic.

For illustration of the twigs and winter buds of this species, see the first of the plates "Miscellaneous Twigs" at the end of this volume.

THE SYCAMORE

Six species of sycamore (*Platanus*) are recognized. They are distributed throughout North America, in Asia Minor, and southwestern Asia. Of three native to North America, one occurs in southern Ontario. All the species are so remarkably alike that they are difficult to separate.

The wood is not of very great importance, but it is used to a certain extent for cabinet-work and interior finish because of its characteristic marking. One species (*Platanus orientalis*) is a common street tree in Europe.

Platanus occidentalis L. **Sycamore**

Other common names: Buttonball, buttonwood, plane tree.
French names: Platane d'Occident, sycomore.

Under favourable conditions the sycamore sometimes reaches a diameter of 7 or 8 ft., but the average is not more than 2½ to 3 ft. The height is about 100 ft.

The trunk is usually short and irregular. A cross-section of it would be eccentric. The crown is large and very wide-spreading when growing in the open. The limbs are very thick and irregular in the way they branch and grow out from the trunk. The roots are shallow and wide-spreading.

The bark of this tree is very characteristic and enables one to distinguish it from any other native tree. On the trunk it breaks off in thin, brittle, irregular plates. Higher up it is smooth, olive-green in colour, and covered with white blotches.

The twigs are smooth and shiny and have a more or less zigzag growth. The winter buds are smooth, brown, and conical in shape and are surrounded by the scar left by the fallen leaf. Before the leaf falls the bud is not visible, since it is concealed beneath the end of the leaf-stem.

SASSAFRAS
S. variifolium
HUDSON BAY
QUEBEC
ONTARIO
MANITOBA
SASKATCHEWAN
NEW BRUNSWICK
NOVA SCOTIA

SYCAMORE
P. occidentalis
HUDSON BAY
QUEBEC
ONTARIO
MANITOBA
SASKATCHEWAN
NEW BRUNSWICK
NOVA SCOTIA

The leaves are very broad for their length and in outline suggest the leaf of the maple. The fruit resembles a small brown ball about 1 in. in diameter hanging from a long stalk. It is composed of many hairy nutlets, or seeds, tightly pressed together.

The tree is confined to rich bottom-lands along the stream courses and shores of lakes. It never forms pure stands but is always scattered or in small groups.

Photo. 10338. *B. R. Morton.*

Sycamore (*Platanus occidentalis*)

In Canada the sycamore is found growing naturally only in Ontario, and only in that part of the province west of a line joining the city of Toronto with the lower end of the Bruce peninsula on lake Huron. It has, however, been successfully planted outside of this range for ornamental purposes. Specimens are growing as far north as the city of Ottawa.

For illustration of the twigs and winter buds of this species, see the first of the plates "Miscellaneous Twigs" at the end of this volume.

Photo. 10065. *B. R. Morton.*
Sycamore (*Platanus occidentalis*): trunk and bark

THE MOUNTAIN ASHES OR ROWANS

The mountain ashes or rowans (*Sorbus*) are found widely distributed as trees or shrubs throughout the northern hemisphere. Three or four species are found on this continent. They are of no importance except for decorative planting. The one most used for this is the European rowan (*Sorbus Aucuparia*). It has larger berries than our native trees.

Sorbus americana Marsh. **Mountain Ash**

Other common names: Rowan tree*, rowan berry*, service-tree.
French names: Cormier, sorbier d'Amérique.

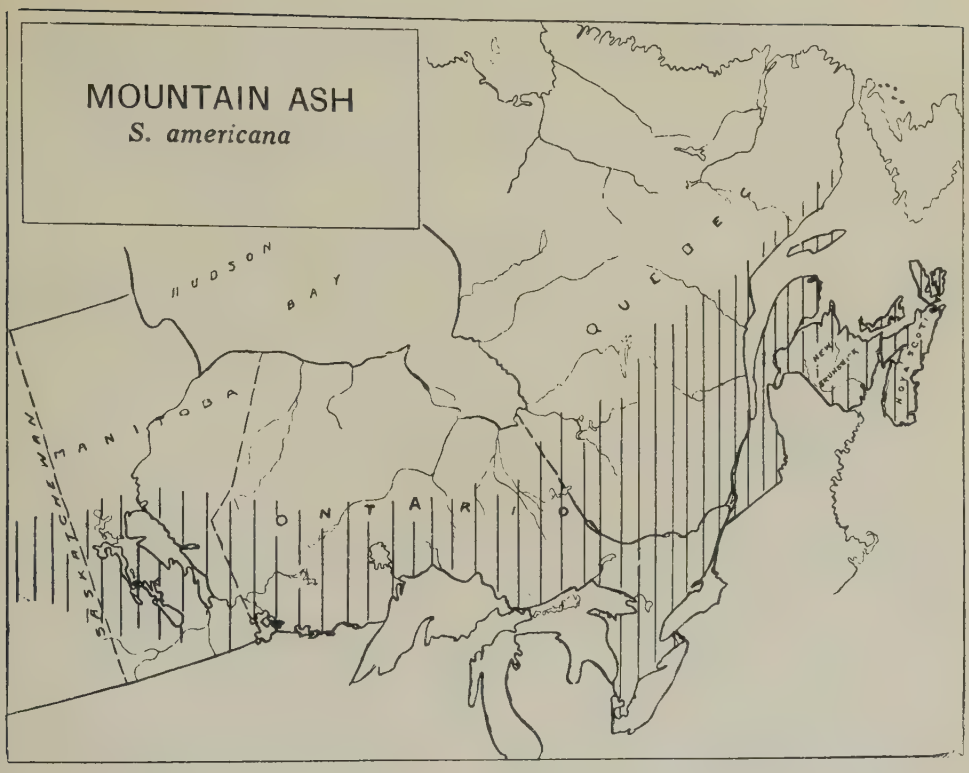
The mountain ash extends from Labrador and Nova Scotia west to British Columbia and Alaska. The western mountain ash in Alberta and British Columbia is recognized by some botanists as a sub-species, *S. americana sitchensis* (Roemer) Sar. It has larger flowers and fruit than the eastern form.

Properly speaking it is not an ash at all, but is related to the apple tree. It is a graceful tree and, having attractive foliage, flowers, and fruit, is much planted for ornamental purposes.

It does not gain a great height, rarely over 30 ft. The crown is narrow, round-topped, and open. The bark is greyish-brown and smooth, sometimes shredding into thin scales. The stout twigs are reddish-brown and smooth. The winter buds are large, about $\frac{1}{4}$ in. long (the end bud considerably longer), conical, with points slightly curved, gummy, and smooth. The European species, the rowan (*Sorbus Aucuparia*), has downy buds.

The leaves are feather-like in the arrangement of the leaflets, from 6 to 8 in. long, and composed of thirteen to seventeen narrow, sharp-toothed leaflets.

The fruit is a bright red berry the size of a pea, which grows in great, flat clusters. These remain on the branches all winter and, in spite of their strong acid flavour, are much sought after by certain birds on their return from the south in the early spring.



Mountain Ash (*Sorbus americana*): leaf

Two western species, mostly subalpine in British Columbia (*Sorbus sitchensis* and *Sorbus occidentalis*), extend through the Rocky Mountains to the mountains of the west coast.

The wood is moderately heavy and hard, but the tree is too small to furnish commercial sizes of lumber. The berries are used for medicinal purposes.

For illustration of the twigs and winter buds of this species, see the second of the plates "Miscellaneous Twigs" at the end of this volume.

THE WITCH HAZEL

Three species of witch hazel (*Hamamelis*) are known, one in North America and two in Asia. They are all small trees or shrubs and not important for lumber.

Hamamelis virginiana L. **Witch Hazel**

Other common names: Winter bloom, snapping hazel.
French name: Hamamélis de Virginie.

The witch hazel is sometimes a small tree 20 to 25 ft. high, but more often is a shrub growing in thickets or clumps on moist sites in ravines and on shady hillsides. In Canada it is found from Nova Scotia westward throughout the southern portions of Quebec and Ontario.

The bark is smooth, brown, and mottled on the trunk and larger branches. On the slender zigzag twigs it is shiny, sometimes downy.

The winter buds are light brown, downy, narrow, long, slightly curved and flattened, and more or less stalked.

The leaves are 4 to 6 in. long and oval in outline. The margin is very wavy-toothed and the base is unsymmetrical. The veining is depressed, hence the surface has a corrugated appearance.

The witch hazel has a curious habit of flowering in the late autumn when its leaves are falling. The flowers come out in small golden-yellow clusters, which have the appearance of a tangled mass. The individual flower with its four long, yellow, twisted petals is small and spidery-like.

The fruit is a peculiar brown, woody, two-celled pod, or capsule, about the size of a large pea which, when it ripens in October, splits open in four directions and expels its two black seeds to some distance. These dried pods remain on the twigs throughout the winter, and, along with the flowers, are features which enable the witch hazel to be distinguished from any other tree with which it is likely to be confused.

The wood is not used commercially, but the bark, twigs, and leaves are astringent, and when distilled with alcohol yield the extract of witch hazel of commerce.

For illustration of the twigs and flowers of this species, see the second of the plates "Miscellaneous Twigs" at the end of this volume, and for illustration of the leaves see page 112.

THE HAWTHORNS

Several hundred species of the hawthorn (*Crataegus*) have been described. Twenty or more of them are found in Canada, of which the greater number occur in the southern portion of the eastern provinces. Two species, the black hawthorn (*Crataegus Douglasii*) and the long-spined hawthorn (*Crataegus columbiana*) are found in British Columbia.

There is no group of trees in Canada in which it is more difficult to separate the different species. So large is this group, and so rapidly is it modifying, that only one who has the time and patience to make a special study of haw-

thorns can hope to know them all. The points of distinction relied upon are found mainly in the flower and the fruit. It is beyond the scope of a book of this nature to take up their minute differences.

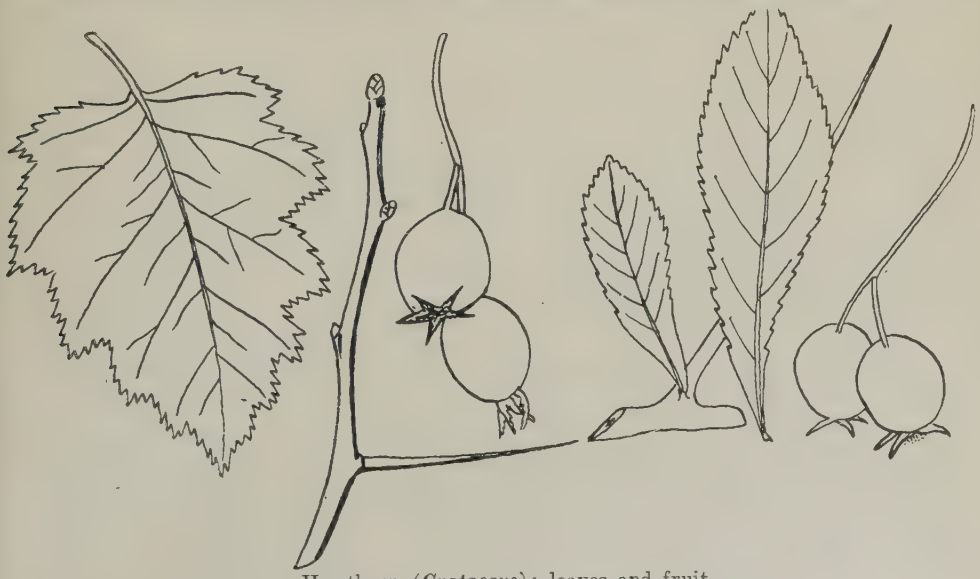
In habit the hawthorns are usually low, wide-spreading, bushy trees, sometimes found growing as shrubs in thickets. Within their range they are common trees along the country roadside, in open places in the farmer's woodlot, and in fence corners.

They can be readily distinguished from other trees by their somewhat zigzag twigs which are well armed with long thorns. These thorns occur just above the point at which the leaf is attached and are usually unbranched and exceedingly sharp. The thorns attached to the trunk and larger branches are frequently branched.

The winter buds are small, shiny, chestnut-brown, rounded, and covered with many overlapping, thick scales.

The fruits, or "haws," as they are sometimes called, when ripe suggest tiny scarlet apples. They are somewhat edible, but as a rule the proportion of bony seed to flesh is so great that they are not much sought after. They sometimes remain on the tree all winter.

The wood of the hawthorns is generally heavy and hard, and is sometimes used for small turnery such as handles, mallets, and wooden novelties.



Hawthorn (*Crataegus*): leaves and fruit

THE PLUMS AND CHERRIES

Over one hundred and twenty species of this group (*Prunus*) have been described. To it belong the plums, cherries, peaches, apricots, and almonds. Only one species of plum and six or seven species of cherry are native to Canada. Two of the cherries are native to the Pacific region.

All the native species, with the exception of the black cherry (*Prunus serotina*) are small trees or shrubs, and of little importance commercially.

The seeds of this group contain more or less prussic acid, and their twigs and bark are characteristically bitter and astringent.

The fruit of the plum is usually more or less two-lobed, with a groove on one side, and is often covered with a whitish bloom. The fruit of the cherry is smaller and without this bloom. The cherry seed is round instead of flat as is that of the plums.

CHERRY AND PLUM LEAVES AND TWIGS

LEAVES.—1 Choke cherry (*Prunus virginiana*). 2 Black cherry (*Prunus serotina*). 3 Pin cherry (*Prunus pennsylvanica*). 4 Canada plum (*Prunus nigra*). 5 Western choke cherry (*Prunus virginiana* var. *demissa*). 6 Bitter cherry (*Prunus emarginata*).

TWIGS.—1 Black cherry (*Prunus serotina*). 2 Bitter cherry (*Prunus emaryinata*). 3 Choke cherry (*Prunus virginiana*). 4 Canada plum (*Prunus nigra*). 5 and 6 Pin cherry (*Prunus pennsylvanica*). 7 Western choke cherry (*Prunus virginiana* var. *demissa*).

Prunus nigra Ait. **Canada Plum**

Other common names: Red plum, wild plum*, horse plum.
French name: Prunier canadien.

The Canada plum is distributed throughout the St. Lawrence valley and westward to the Red river in Manitoba.

It grows as a small tree 20 to 25 ft. in height, often as a shrub in thickets. The bark is greyish-brown and at first is smooth, but later breaks and curls back into papery plates, exposing the rough inner bark.

The crown is narrow, and is composed of stiff, erect branches, ending in stiff, slender, smooth twigs which, in their second year, develop spiny spurs. These coarse spurs, which may develop leaves, distinguish this tree from any of the cherries.

The winter buds are brown, $\frac{1}{8}$ to $\frac{1}{4}$ in. long, conical, and pointed. The terminal bud of the twig is absent.

The leaves are 3 to 5 in. long and $1\frac{1}{2}$ to 3 in. broad; rather rounded in outline, with the tip suddenly drawn to a point. They are thick, firm, dark-green and dull.

The fruit, which ripens in August, is oblong in shape, 1 in. or more in length. The skin is smooth, orange-red when ripe, thick, and tough. The plum is edible. The pit is the typical flat plum-stone.

Prunus americana Marsh. **Wild Plum**

French name: Prunier d'Amérique.

The wild plum is found growing in rich soil along the borders of streams and swamps in southern Ontario and Manitoba.

It is a small tree 20 to 30 ft. in height, with a trunk rarely more than 1 inch in diameter and dividing usually about 4 or 5 feet from the ground. It has a broad graceful head with many spreading branches, often pendulous at the end.

The bark is dark-brown tinged with red, the outer layers separating into long thin persistent plates.

The winter buds are chestnut-brown, $\frac{1}{8}$ to $\frac{1}{4}$ in. long.

The leaves are 3 to 4 in. long and $1\frac{1}{2}$ to $1\frac{3}{4}$ in. wide, oval in outline and doubly serrate.

The fruit ripens in August to October and is round or slightly elongated. It is usually less than 1 in. in diameter and when ripe is orange in colour, often with a red cheek. It has a tough skin and juicy, acid flesh.

Prunus emarginata Walp. **Bitter Cherry**

Other common names: Wild Plum*, wild cherry*.
French name: Cerisier amer.

The bitter cherry is a shrub or small tree, occasionally 30 to 50 ft. high and 10 to 12 in. in diameter. It is found throughout southern British Columbia growing in moist places in the valleys, sometimes on dry hillsides, and does not appear east of the Rocky mountains. Its wood is not utilized in Canada. This tree is the western counterpart of the pin cherry (*P. pennsylvanica*).

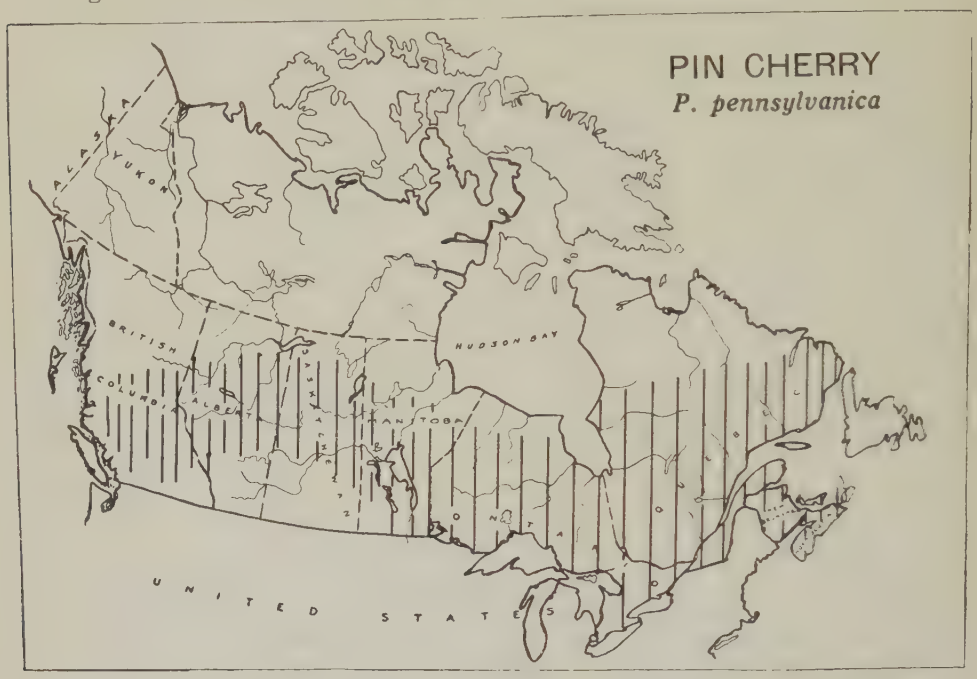
The bark is thin, smooth, greyish to brown in colour, and exceedingly bitter to the taste.

The twigs are slender, flexible, and bright red. The twigs of the other coast cherry, the Western choke cherry, are of a light-brown colour.

The winter buds are chestnut-brown, pointed, and very small, about $\frac{1}{8}$ in. long. Those of the Western choke cherry are much longer and larger.

The leaves are variable in size, 1 to 3 in. long and $\frac{1}{3}$ to $1\frac{1}{2}$ in. broad. The teeth in the margin are minute and rounded.

The fruit is an extremely bitter, dark-red cherry about the size of a pea, which grows either singly or in clusters.



Prunus pennsylvanica L. **Pin Cherry**

Other common names: Bird cherry, wild red cherry*, pigeon cherry.

French name: Petit merisier.

The pin cherry is a small tree or shrub 10 to 25 ft. high and 4 to 8 in. in diameter.

It is found in clearings, burned-over lands, and along roadsides. It is widely distributed in Canada, ranging from the Atlantic to the Rocky mountains. It has been reported from British Columbia, but probably has been mistaken for the bitter cherry (*P. emarginata*). Its wood is seldom put to any commercial use.

The bark is smooth, reddish-brown, and covered with conspicuous orange or rusty-coloured, powdery lenticels. These lenticels are not elongated to the same extent as those of the black cherry. The inner bark is a bright green. On older trunks the bark separates into papery plates.

The twigs are slender, smooth, red, and shiny, and bitter if chewed. The two-year-old twigs send out short lateral spur-like branchlets. The winter buds are very small, blunt, reddish-brown and characteristically clustered at the tip of the twig.

The leaves are 3 to 5 in. long and $\frac{3}{4}$ to 1 in. wide; they are long and narrow, somewhat like the peach leaf. They are shiny, green, smooth, fine-toothed, and more tapered than those of the black cherry.

The fruit is pea-sized, cherry-red, and sour. It can readily be distinguished from the fruit of the black or choke cherries by the difference in colour and flavour and by the fact that the cherries are not in elongated clusters. Each is borne on a single long stem as are the garden cherries.

Prunus virginiana L. **Choke Cherry**

Other common name: Wild cherry*.

French names: Cerisier à grappes, cerisier de Virginie, cerisier sauvage.

The choke cherry is a shrub or small tree—more often a shrub—10 to 20 ft. high and 4 to 6 in. in diameter.

It is found all the way across Canada, from the Atlantic to the Rocky mountains, growing in fence corners, open borders of woodlots, and along the roadsides, but is not found in commercial sizes or quantities.

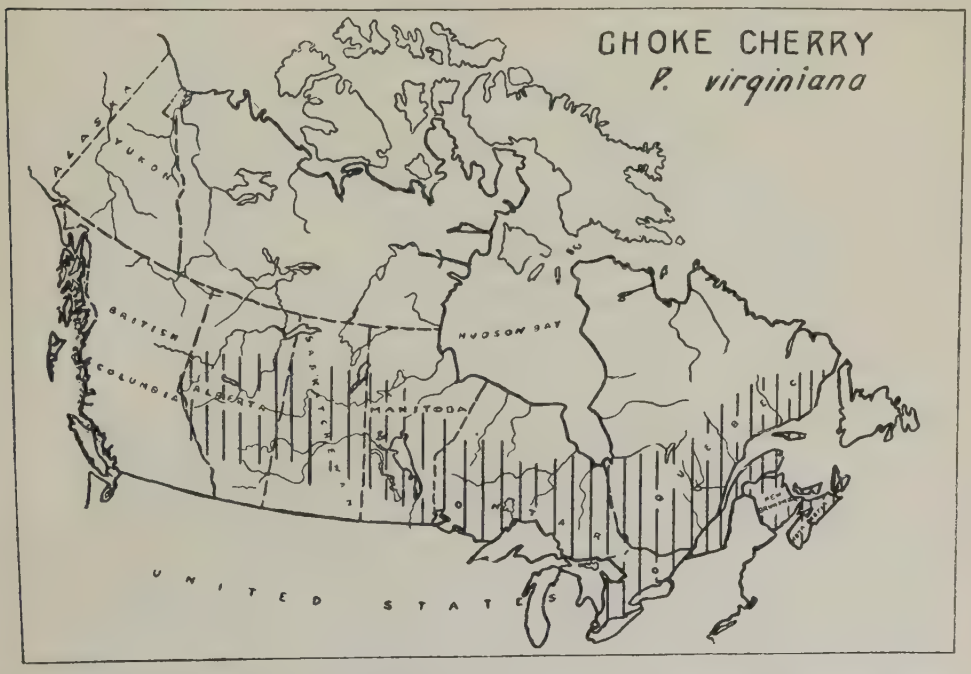
The bark is smooth, dull greyish-brown, and peels easily on branches, showing a bright green, inner bark which has a disagreeable odour. It much resembles the young bird cherry, but can be distinguished from it by absence of rusty-coloured powder about the slits or lenticels.

The twigs are smooth, reddish-brown, and have a strong odour when crushed and, like all cherry twigs, are bitter when chewed.

The winter buds are brownish, smooth, sharp-pointed and somewhat turned away from the twig. The scales have a pale margin.

The leaves are 2 to 4 in. long and 1 to 2 in. wide, rather broad and blunt in appearance, with a more or less sharp tip.

The fruit is a dark-red or black cherry the size of a pea and grows in elongated clusters. It has a very characteristic astringent taste from which the tree gets its name.



Prunus virginiana L. var. **demissa** Torr. **Western Choke Cherry**

Other common name: Wild cherry.

French name: Cerisier sauvage de l'Ouest.

The Western choke cherry is found in Canada on the British Columbia coast and Vancouver island, on moist soil along the borders of streams. It sometimes attains a height of 25 ft., but is more often a shrub 8 to 10 ft. high. It is of no commercial importance.

CHERRIES AND PLUMS (*Prunus*)

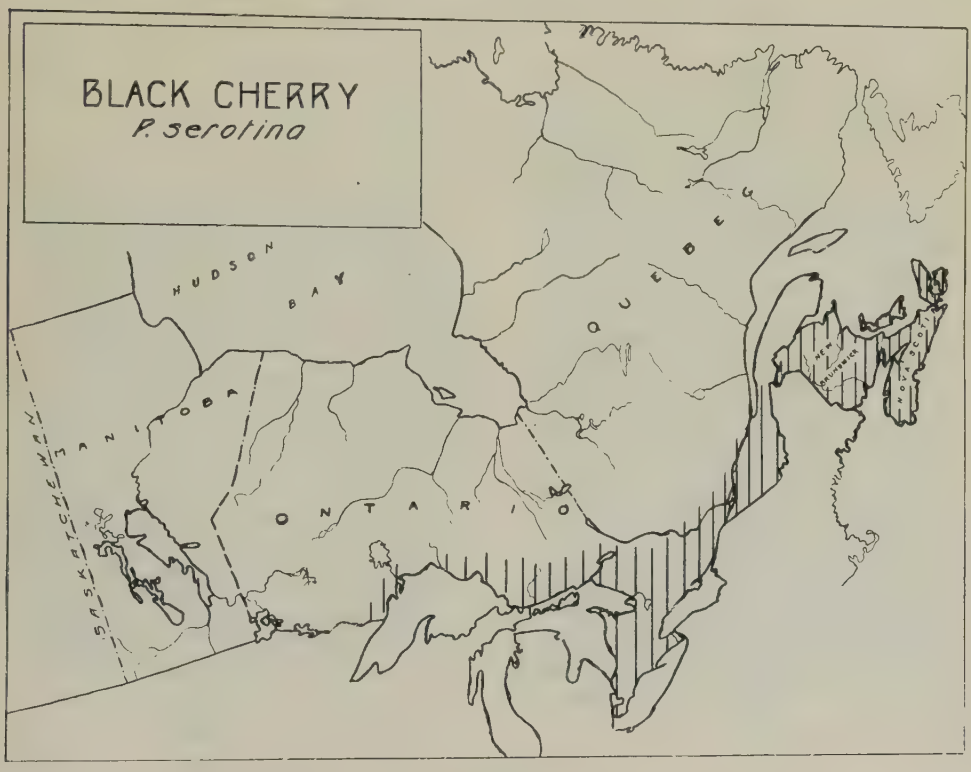
	BLACK CHERRY (*P. serotina*)	CHOKE CHERRY (*P. virginiana*)	PIN CHERRY (*P. pennsylvanica*)	BITTER CHERRY (*P. emarginata*)	WESTERN CHOKE CHERRY (*P. virginiana* var. *demissa*)	CANADA PLUM (*P. nigra*)
BARK	Smooth on young trees, old trunks are scaly. Distinguished from choke cherry by its whitish, elongated slits or lenticels.	Smooth and shows bright green when peeled. No powdery, rusty-coloured lenticels as on the bird cherry	Smooth and bright green beneath the surface. Lenticels rusty-coloured and not elongated as those of the black cherry.	Smooth and exceedingly bitter.	Smooth but irregularly roughened by scales.	Smooth on young trunks, on older trees splits and curls exposing scaly bark.
TWIGS	Bitter. Stouter than those of the choke cherry as a rule.	Almond-flavoured. Have a strong odour when broken.	Red, shiny, very slender, and bitter.	Very bitter, bright red and flexible.	Light brown in colour.	Second year twigs send out short, spiny spurs which become leafy.
WINTER BUDS	Pointed or blunt. Smaller than those of the choke cherry.	Sharp-pointed and somewhat turned away from the twig. Scales have a pale margin.	Blunt and very small, and clustered at the end of the twig.	Pointed. ⅛ in. long.	Pointed. ½ to 1 in. long.	Pointed. Terminal bud missing.
LEAVES	On young trees they are very much like those of the choke cherry, on older trees they are considerably longer and thicker.	Broad and blunt with a sharp tip.	Narrow, somewhat like peach leaves. Taper more than those of the black cherry. Shiny green.	Extremely bitter. Teeth minute and rounded.	Larger than those of the bitter cherry. Teeth minute and sharp. Thick and leathery.	Rather round in outline with tip suddenly drawn out
FRUIT	Size of a pea. Borne in clusters. Black when ripe.	Size of a pea. Borne in clusters. Dark red to black when ripe. Characteristic dry flavour.	Size of a pea. Each cherry on a long stem like those of the garden cherry. Red and sour.	Size of a pea. In clusters or singly. Dark red when ripe. Extremely bitter.	Larger than bitter cherry. Borne in clusters. Shiny black. Astringent.	A plum 1 to 1¼ in. long with a thick, tough, orange-red skin.

On young trunks the bark is brown, on older trunks it is greyish and roughened by hard scales.

The twigs are smooth and the buds brown and pointed.

The leaves are somewhat thick and leathery, the margins toothed with fine, sharp teeth.

The cherries are shiny, black, and borne in dense elongated clusters. They are astringent to the taste, hence the common name.



Prunus serotina Ehrh. **Black Cherry**

Other common names: Wild black cherry*, rum cherry.
French names: Cerisier tardif, cerisier noir, cerisier d'automne, merisier (France).

The black cherry averages 60 to 70 ft. in height and 1½ to 2 ft. in diameter. Growing in a dense stand it produces a straight, columnar trunk. The crown is narrow and irregular, owing to the zigzag growth of the branches.

In Canada this tree is found from Nova Scotia to lake Superior, growing on a wide variety of soils and associated with other hardwoods.

The bark is smooth on young trees, with conspicuous, whitish, horizontal slits or lenticels. On old trees it cracks and breaks off in small, thin, brittle scales.

The twigs are reddish-brown, slender, rigid, and bitter to the taste.

The winter buds are a light chestnut-brown, pointed or blunt-tipped, and have closely overlapping scales. The margins of the scales are not pale as those of the choke cherry.

The leaves on young trees are often broad and blunt with a sharp tip; on older trees they are longer. The teeth are finely and firmly cut.

The fruit is a juicy, reddish-black cherry, about the size of a large pea, and grows in elongated clusters. It has a peculiar but not unpleasant flavour.

The tree is nowhere abundant and its lumber is produced in small quantities only. The wood has a rich reddish-brown colour, a fine even texture without much figure, and is a little lighter in weight than yellow birch. It takes a fine polish and was used extensively for furniture in times past, some of the antique colonial pieces being fine examples of the value of this wood. It is used for furniture, cabinet work, and decorative finish in houses, cars, boats, and vehicles.

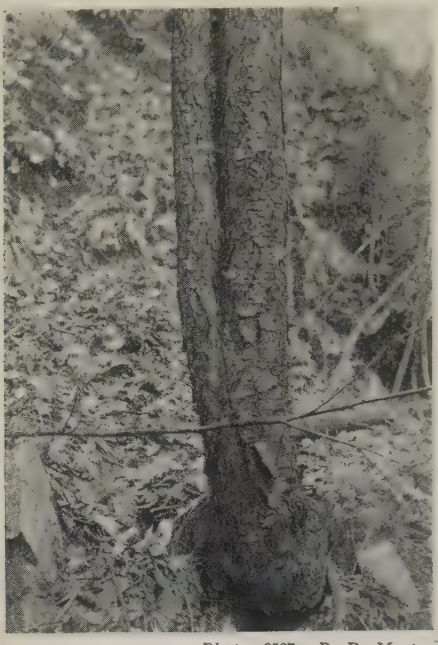


Photo. 8587. *B. R. Morton.*

Black cherry (*Prunus serotina*): trunk and bark

Photo. 10039. *B. R. Morton.*

Kentucky coffee-tree (*Gymnocladus dioica*): trunk and bark

THE COFFEE-TREE

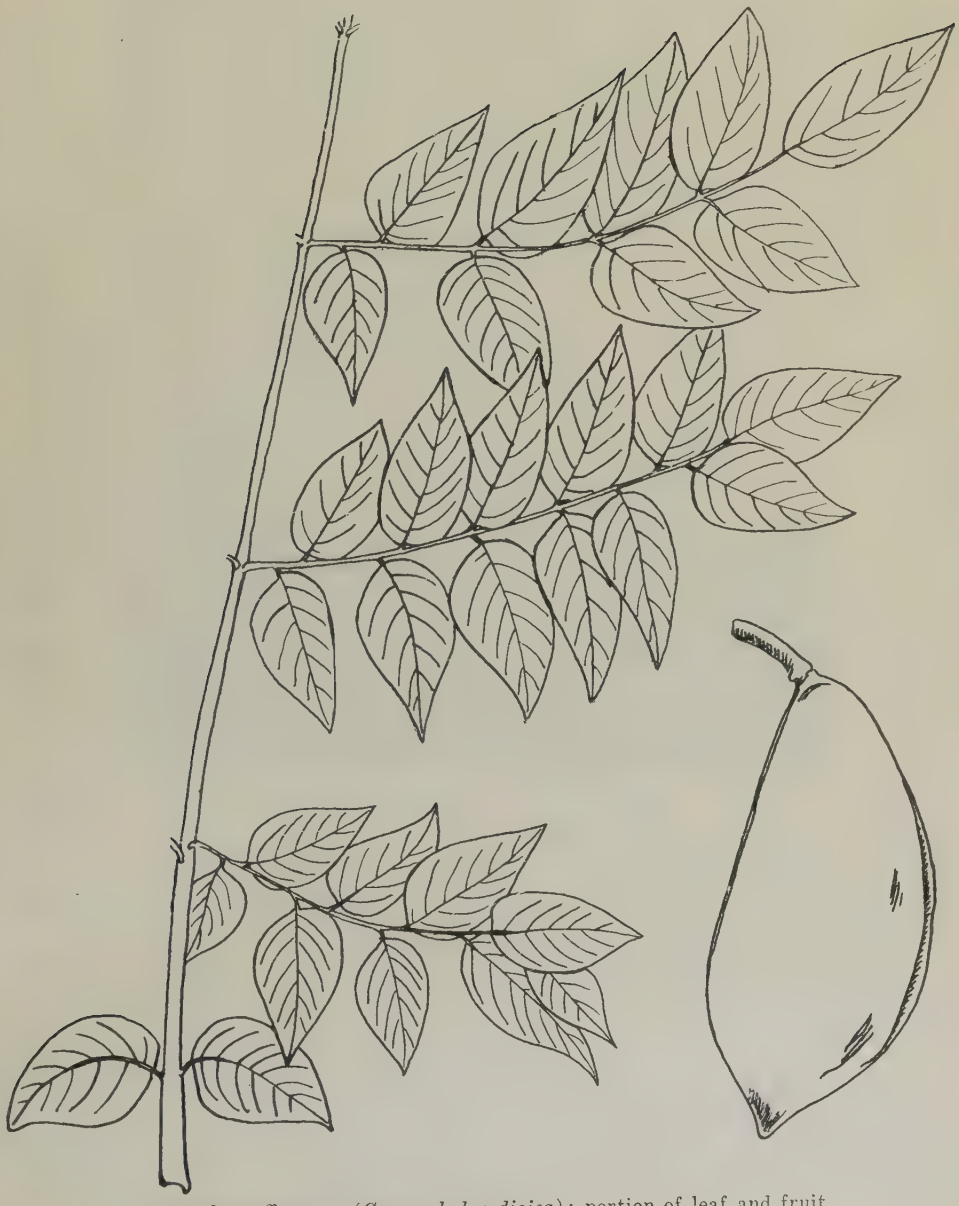
There are only two known species of coffee-tree (*Gymnocladus*), one native to this continent and the other to southern and western China. Both can be readily recognized by their heavy branches, stout, blunt twigs with red pith, and large, doubly compound leaves.

Gymnocladus dioica (L.) K. Koch **Kentucky Coffee-tree**

Other common names: Coffee-tree, coffee bean.
French name: Chicot du Canada.

The coffee-tree is a rare species and is found, in Canada, only in south-western Ontario from Niagara westward to lake St. Clair, but is nowhere common. Scattered trees occur in rich woods but they have been mostly cut from the farm land on which they once grew. The wood is not used commercially at present.

It is a medium-sized tree sometimes attaining a height of 80 ft. and a diameter of 2 ft., but is ordinarily a smaller tree which divides comparatively near the ground into three or four upright limbs, which form a narrow head.



Kentucky coffee-tree (*Gymnocladus dioica*): portion of leaf and fruit.

Photo. 10038. *B. R. Morton.*

Kentucky coffee-tree (*Gymnocladus dioica*).

The bark is dark brown and roughened by large scales at the base and by many thin, curved ridges higher up and on the larger branches.

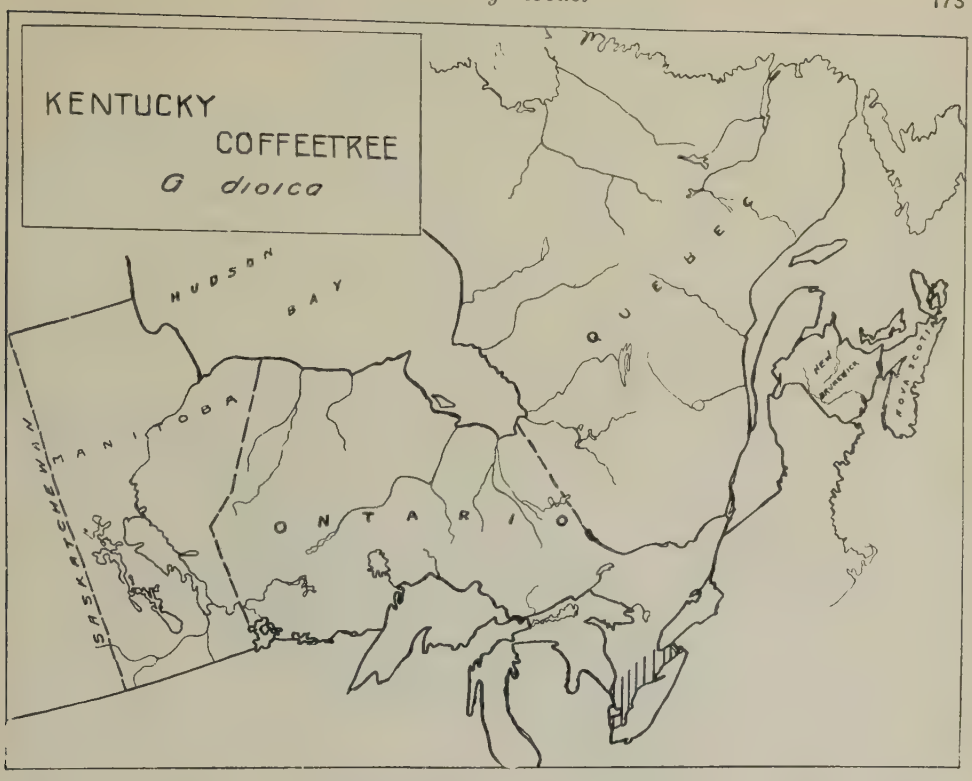
The twigs are very coarse and blunt and often downy. The pith is salmon-pink or brown in colour. These stout twigs enable one to distinguish the tree at some distance.

The winter buds are very tiny for such a large twig. They are downy and almost sunk out of sight above a broad crescent or heart-shaped leaf-scar.

The leaf is very large, from 2 to 3 ft. long. It is doubly compound, i.e., many leaflets are attached to a common stem, which in turn is again attached to a larger stem that is attached to the twig. The dull, dark-green leaflets are without teeth on the margin.

The fruit is a curved pod 4 to 8 in. long and 2 in. broad which often remains on the tree well into the winter. The seed is brown and flattened. These seeds were at one time used as a substitute for coffee, hence the tree's common name.

For illustration of the twigs and winter buds of this species, see the second of the plates "Miscellaneous Twigs" at the end of this volume.



THE HONEY LOCUST

Gleditsia triacanthos L. **Honey Locust**

Other common names: Three-thorned acacia, thorny locust, sweet locust.

French name: Févier à trois épines.

There is some doubt as to whether honey locust is a native species in Canada, but, since it has been established for a long time, and is a fairly common tree in southern Ontario, it is felt that it should be included in this treatise.

In the more favourable portion of its range, it attains a height of 70 to 140 feet and a diameter of 2 to 3 feet or even more, but in Canada it seldom reaches these dimensions. It is frequently grown as a hedge.

The bark of the trunk is $\frac{1}{2}$ to $\frac{3}{4}$ in. thick, divided by deep fissures into long, narrow longitudinal ridges and roughened on its surface by small persistent scales.

The twigs are greenish- to reddish-brown and are armed with stout rigid long-pointed simple or three-pronged spines. The spines may persist on the larger branches or even on the trunk of the tree.

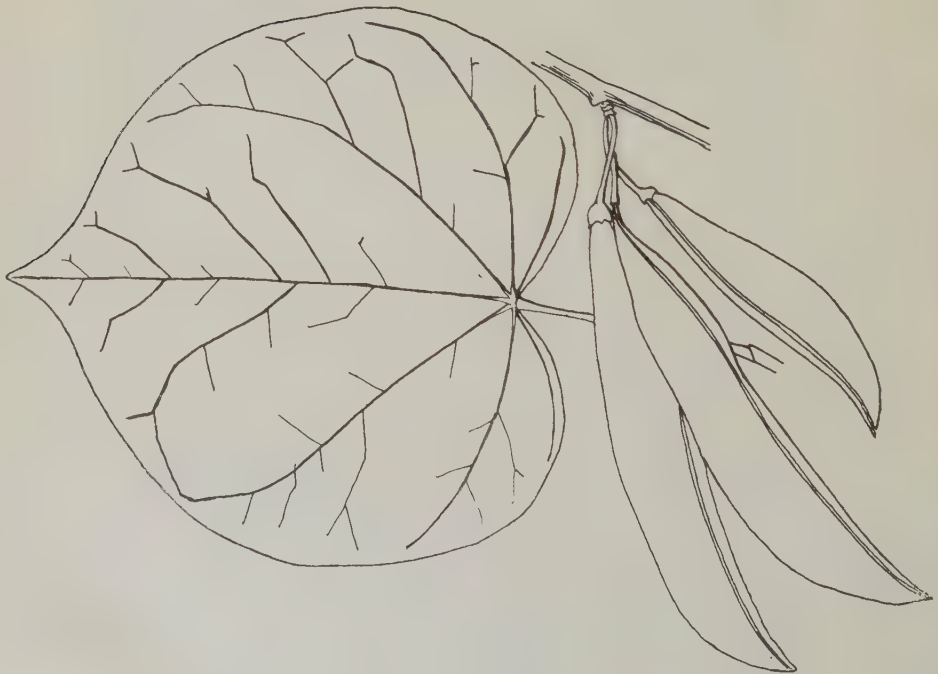
Belonging to the pea family, the leaves are pinnately compound or sometimes bipinnate and are six inches or more in length.

The flowers, which appear in June, are greenish, the staminate in short many-flowered pubescent racemes 2 to $2\frac{1}{2}$ inches long and often clustered; the pistillate in slender graceful few-flowered, usually solitary racemes.

The fruit is a thin, flat, many-seeded pod a foot or more in length by $1\frac{1}{4}$ inches broad, generally in clusters of two or three. As it matures, the pod becomes twisted corkscrew-like.

The wood is hard, strong, and coarse-grained. The heartwood is red or red-brown and the sapwood thin and pale in colour. Owing to the fact that it is very durable in contact with the ground, it is frequently used for fence-posts and rails. It is of very little commercial importance in Canada.

Sumach (*Rhus*): leaf and fruit



Redbud (*Cercis canadensis*): leaf and fruit

THE REDBUD

Of the seven species of redbud (*Cercis*) three occur on this continent. One of these, *Cercis canadensis*, is found in southern Ontario, but it is not common. None of the species is of importance except for decorative planting. They can be readily recognized by their showy, magenta flowers and simple, heart-shaped leaves.

Cercis canadensis L. **Redbud**

Other common name: Judas tree.
French name: Gainier du Canada.

The redbud is a rare tree in Canada. An occasional tree is found in south-western Ontario in the counties bordering the shores of lake Ontario and lake Erie.

It is small, ordinarily not much more than 20 to 25 ft. high, with a flat, irregular crown, occasionally upright. It is valuable only for ornamental purposes.

The bark of the trunk is very dark and roughened by scaly ridges. On the slender twigs it is reddish-brown and smooth.

The winter buds are small, dark red, blunt, and slightly flattened or pressed against the stem. The flower buds are larger and are sometimes located on the underside of the twig at the base, where it joins a larger branch. This latter peculiarity is one of the distinguishing features of the tree.

The leaves are broadly heart-shaped and from 3 to 5 in. long. They are dark green, smooth, and glossy, with toothless margins and slender stems.

The flowers are shaped like the pea blossom and are rose-pink to purple in colour. They come out in clusters all along the twigs and branchlets, even appearing on the larger limbs and trunk of the tree at times. Opening up early in the season, before the leaves are fully out, they colour the whole tree and make it a very beautiful and conspicuous object.

The fruit is a thin, flat-pointed pod, 2 to 3 in. long, containing small compressed seeds.

For illustration of the twigs and winter buds of this species, see the first of the plates "Miscellaneous Twigs" at the end of this volume.

THE HOP-TREE

Ptelea trifoliata L. **Hop-tree**

Other common name: Wafer ash.

This is a small tree, more often a shrub, which is found only along lake Erie.

The leaf is compound, consisting of three leaflets covered with innumerable transparent dots. The leaflets are ovate and without stalks, the terminal one being the largest.

The bark is dark reddish-brown and smooth, except for warty protuberances.

The fruit is very similar in appearance to that of the elm, but much larger. It is circular, 1 inch across, with a two-seeded chamber surrounded by a broad, tough, veined wing.

The wood is heavy, hard, close-grained, yellow-brown with a thin sapwood. It is of no commercial importance.

THE SUMACH

Nearly all of the seven or eight species of sumach (*Rhus*) found in Canada are shrubs. Only four of the twenty or so species found on this continent reach tree size, and none of them is sufficiently large to be of importance. Some of the Asiatic species, however, are of importance because of furnishing gum, wax, and other products. The valuable lac used in lacquer ware is obtained from these trees. All of the species have a more or less sticky juice.

Photo. 11006. *R. H. Campbell.*

Sumach (*Rhus typhina*)

Rhus typhina L. **Staghorn Sumach**

Other common name: Sumach.

French names: Sumac amaranthe, vinaigrier, sumac de Virginie.

The staghorn sumach is common on thin, rocky, or gravelly soils from Nova Scotia to Georgian bay and lake Huron in Ontario.

It is a small tree or shrub, often forming thickets. Ordinarily it is 10 to 15 ft. high but occasionally a little taller. The trunk is more or less crooked and inclined. The branches are also very irregular in growth and divide into a comparatively small number of stout, curved twigs which suggest the horns of a stag, hence the common name. When in leaf the tree has a rather flat, spreading top.

The bark is brown, thin, and smooth except on large trees, when it is sometimes scaly. The twigs are coated with fine, thick, soft, brown hair. When growing near roadsides, or railways, or wherever there is much dust or soot in the air, these hairy twigs become heavily coated with it and if grasped will soil the hand. When cut they exude a milky juice.

The leaves are composed of eleven to thirty-one small leaflets attached to a common stem. The leaflets are narrow and pointed like those of the willow. Their margins are coarsely toothed, dark-green above, and pale beneath. This graceful, drooping, fern-like foliage, which becomes a beautiful scarlet in the autumn, has caused the tree to be much used for ornamental planting.

The fruit is a curious pyramidal cluster of short, red hairs, with a distinctly acid taste, which coat tiny, bony, covered seeds. These conspicuous red clusters persist throughout the winter on the tips of the stout twigs, and add to the picturesqueness of the tree.

This tree is sometimes sawn into lumber and used for decorative finishing work. Its wood is orange-coloured, and is streaked with broad, green rays.

For illustration of the twigs and winter buds of this species, see the second of the plates "Miscellaneous Twigs" at the end of this volume.

THE MAPLES

Seventy species of maple (*Acer*) occur throughout the world. They are most abundant in eastern Asia, thirty-five species being found in China and Japan. Ten are found in Canada, of which three are confined to British Columbia. Many exotic species have been introduced for ornamental planting, the most common of which are the sycamore maple (*Acer pseudoplatanus*) and the Norway maple (*Acer platanoides*), both from Europe. Japanese species are also considerably used for decorative purposes.

Maple is the second Canadian hardwood in point of importance and is characterized by the diversity of its uses. It is used for flooring, furniture, vehicles, agricultural implements, boats, interior woodwork in houses, handles, and many other purposes. The sugar maple possesses the qualities of hardness, strength, and stiffness in a greater degree than any of the other species and is, therefore, most sought after. "Curly" and "bird's-eye" maple, esteemed for furniture making, are unusual forms occasionally met with.

The sap of all the maples contains sugar and in pioneer days, in times of scarcity, even the Manitoba maple, the least productive of the family in this respect, was tapped for the purpose of boiling the sap to obtain sugar. In commercial practice, however, only the sugar maple (*Acer saccharum*) is tapped for sugar making. The maple sugar industry is organized on a commercial basis in Eastern Canada and particularly in the Eastern Townships in Quebec.

Like the ashes and the dogwoods, the leaves and the winter buds of the maples always occur in pairs on the opposite sides of the twig, and, therefore, the twigs and branches must also be of this opposite character. The fruit is composed of a pair (occasionally three or four) of seed-like carpels, or keys, joined together, each carpel with a distinct wing.

Acer spicatum Lam. **Mountain Maple**

Other common name: Dwarf maple*.

French names: Érable bâtard, plaine bleue, érable à épis, plaine bâtarde.

This small bushy tree or shrub is rarely more than 25 ft. in height or more than 5 to 7 in. in diameter. It is the smallest of the eastern maples and is found more commonly as a shrub than as a tree.

The bark is greyish to brown in colour, thin, smooth, sometimes slightly furrowed or roughened.

The twigs are pink to purplish in colour and covered with a delicate bloom. The pith is brown as in the striped maple.

The winter buds are small, pointed, and slender and of a red or greenish colour. They are smaller in diameter just above the point of attachment, which gives them a somewhat stalked appearance.

The leaves are three-lobed, as a rule, coarsely toothed, thin and papery to the touch, and downy beneath.

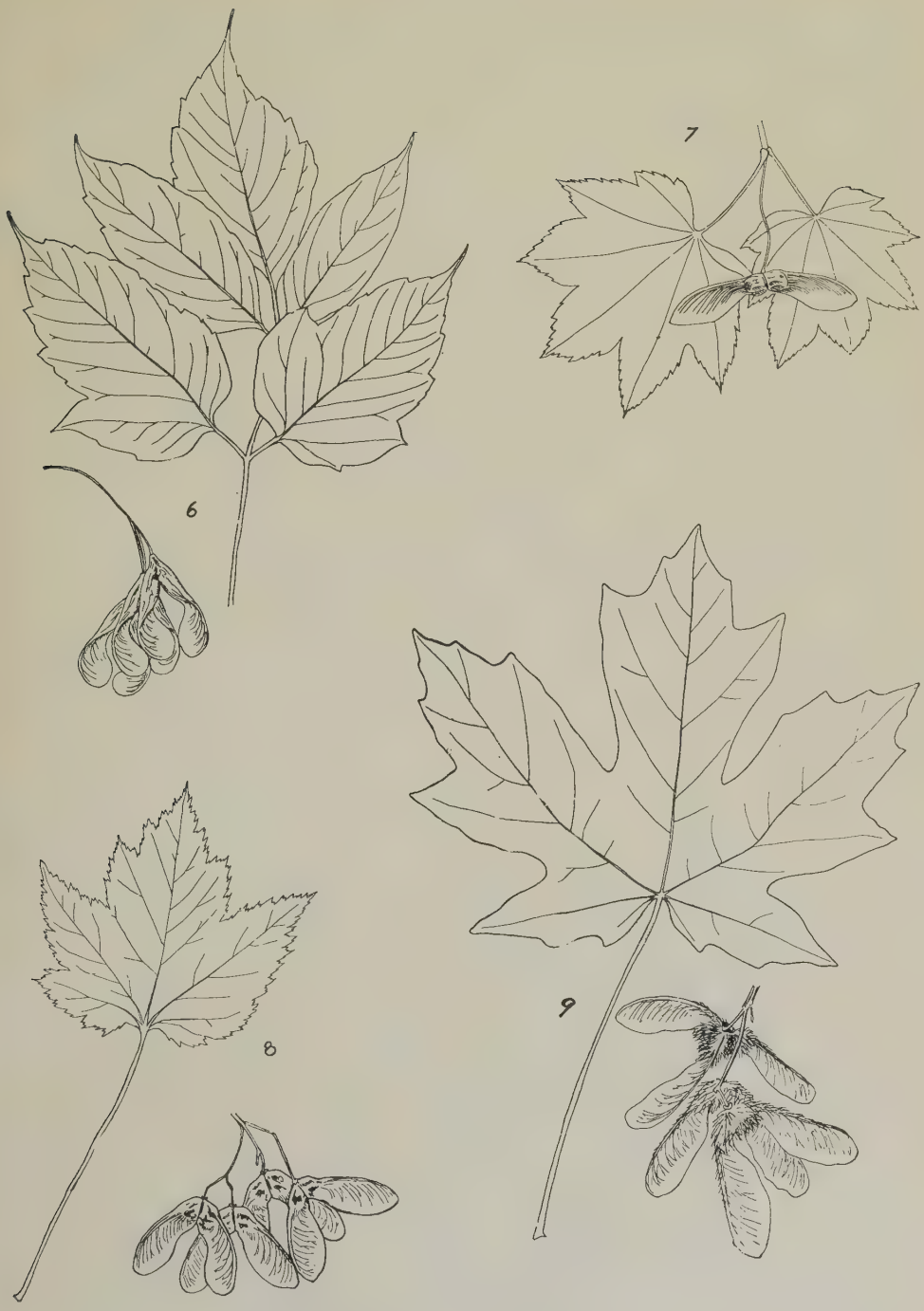
The seeds, which are bright red during the summer, are brown in September. They have wide-spread wings and are borne in a string along a stalk or raceme. The seed portion has a pit-like depression on one side.

The mountain maple prefers moist, rich soils on rocky hillsides or along small streams. It ranges throughout eastern Canada and extends as far west as Saskatchewan.

61331—12

MAPLE LEAVES AND FRUIT

1 Silver maple (*Acer saccharinum*). 2 Sugar maple (*Acer saccharum*). 3 Striped maple (*Acer pennsylvanicum*). 4 Red maple (*Acer rubrum*). 5 Mountain maple (*Acer spicatum*).



MAPLE LEAVES AND FRUIT

6 Manitoba maple (*Acer Negundo*). 7 Vine maple (*Acer circinatum*). 8 Dwarf maple (*Acer glabrum* var. *Douglasii*). 9 Broad-leaved maple (*Acer macrophyllum*).

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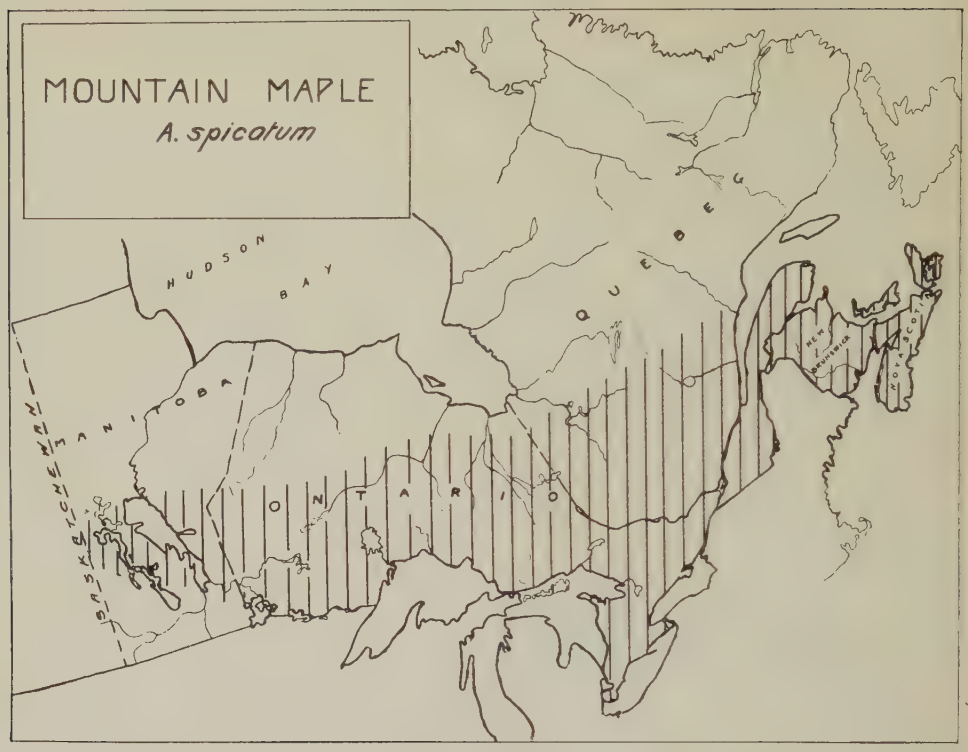
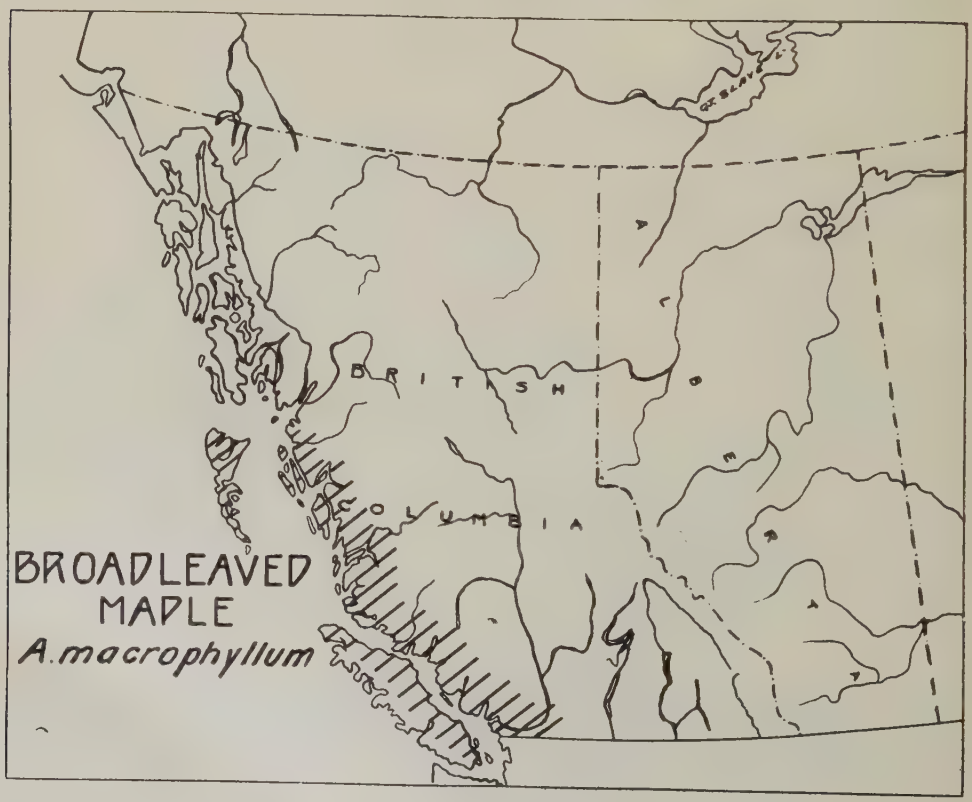

MOUNTAIN MAPLE
A. spicatum
HUDSON BAY
ONTARIO
QUEBEC


BRITISH COLUMBIA
BROADLEAVED MAPLE
A. macrophyllum

Acer pennsylvanicum L. **Striped Maple**

Other common names: Moosewood, moose maple.
French names: Bois barré, érable de Pennsylvanie, bois noir.

The striped maple, like the mountain maple, is a small tree 15 to 30 ft. high and 5 to 7 in. in diameter, but it is more often found as a large shrub growing in the shade of other hardwoods. Its wood is not used commercially.

It gets its name from its smooth, green bark which is striped with vertical, white cracks. Corky bark is not formed.

The twigs are smooth, rose-coloured or green, and without bloom. They are conspicuously ridged, with raised lines just above the leaf-scars. The leaf-scars encircle the stem. The pith is brown.

The winter buds are shiny, rose-coloured, and not so sharp-pointed as those of the mountain maple. They are four-sided in cross-section and have a somewhat stalked appearance.

The leaves are large, 5 to 6 in. long, thin, and in outline not unlike a goose's foot. They are finely and sharply double-toothed.

As in the case of the mountain maple the seed is pitted on one side, but the wings of the striped maple are larger and more widely spread than those of the other maples.

This maple is found from Nova Scotia to lake Superior.

Acer macrophyllum Pursh **Broad-leaved Maple**

Other common names: Big-leaved maple, Oregon maple, British Columbia maple.
French name: Érable à grandes feuilles.

The broad-leaved maple is a tree 40 to 80 ft. high and 1 to 2½ ft. in diameter. On poor soil and in open positions it is often short-stemmed, crooked, and not over 25 ft. in height.

It grows at a moderate rate, is fairly persistent, and can endure considerable shading, especially when young.

It does best on moist humus or gravelly soils and where there is abundance of rainfall. In Canada it is confined to the coast and islands of British Columbia from Alaska south.

The bark is reddish-brown, deeply furrowed, and broken into squarish scales; on the twigs it is green or dark-red, and covered with pale spots.

The leaves are five-lobed, 7 to 14 in. wide, and have stems 6 to 12 in. long. They are the largest maple leaves in Canada. They are thick, smooth, and dark-green. The margins are toothless and the notches deep and narrow.

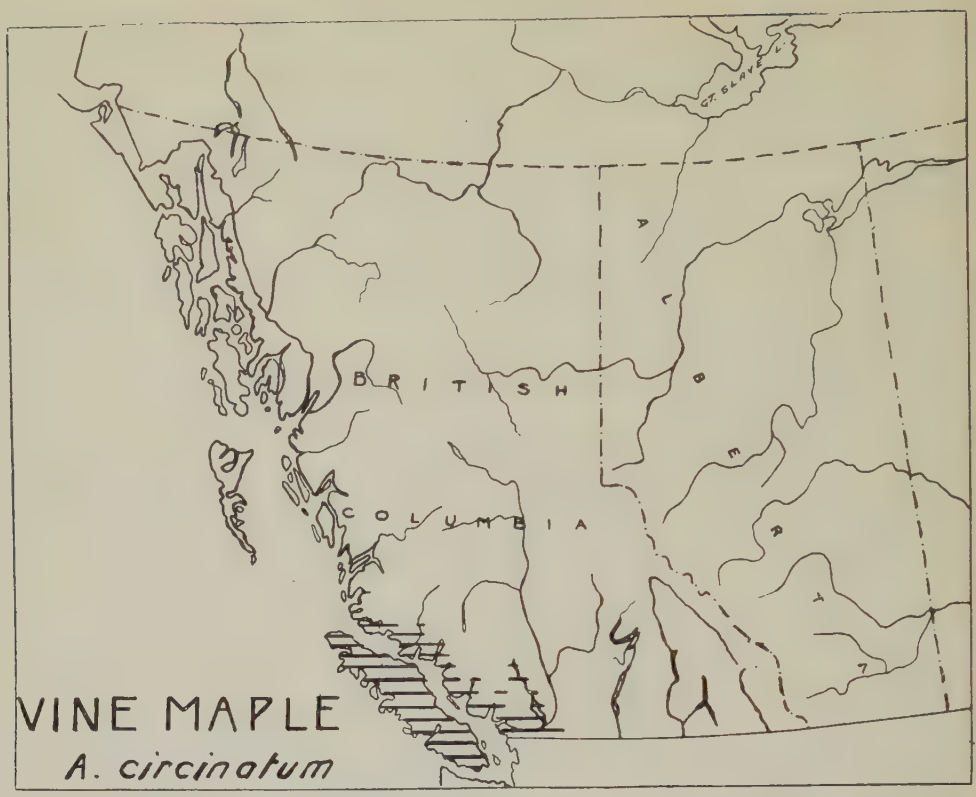
The wings of the seed are 1½ in. long and ½ in. wide. Frequently three and even four seeds are joined to one stem. The seed portion of the key is covered with sharp, bristle-like hairs, a feature by which they can be readily known.

The limited supply of suitable hardwoods in British Columbia causes increasing demand for this wood in flooring, furniture, implements, interior finish, and for uses where a hardwood is preferred. The wood is light-brown, is about the same weight as the silver maple, and has a fine, uniform texture.

Acer circinatum Pursh **Vine Maple**

Other common name: Mountain maple*.
French name: Érable circiné.

The vine maple is usually an arborescent shrub. The trunk, which is 3 to 6 in. in diameter and 15 to 20 ft. in length, is often prostrate and has a crooked, crawling vine-like appearance especially in forests where snow has bent the long slender branches to the ground. It grows in the shade of other trees and is frequently found extending its stem among their trunks toward some more open spot. Where the stem touches the ground it frequently takes root.



It is found on the rich moist soil along streams on Vancouver island and on the adjacent mainland.

The bark is thin, smooth, marked by shallow fissures, and a dull greyish-brown in colour.

The twigs are reddish-brown, sometimes covered with a whitish bloom in winter.

The winter buds are $\frac{1}{8}$ in. long, bright-red in colour, and blunt. Those of the dwarf maple are sharp.

The leaves in general outline are circular, having from seven to nine sharp-pointed, sharp-toothed lobes.

The wings of the fruit are red and wide-spreading and about $1\frac{1}{2}$ in. long. They are more widely spread and usually longer than those of the dwarf maple.

Acer glabrum Torr. var. **Douglasii** Dipp. **Dwarf Maple**

Other common name: Red maple.*

French name: Érable nain.

The dwarf maple is sometimes a tree 20 to 25 ft. high and 6 to 8 in. in diameter but more often it is a shrub 6 to 10 ft. high.

It grows singly and in small clumps on thin, gravelly soil, and along the gulches and borders of mountain streams. It is found from Alaska southward along the Pacific coast and throughout the southern part of British Columbia.

The bark is smooth and reddish-brown.

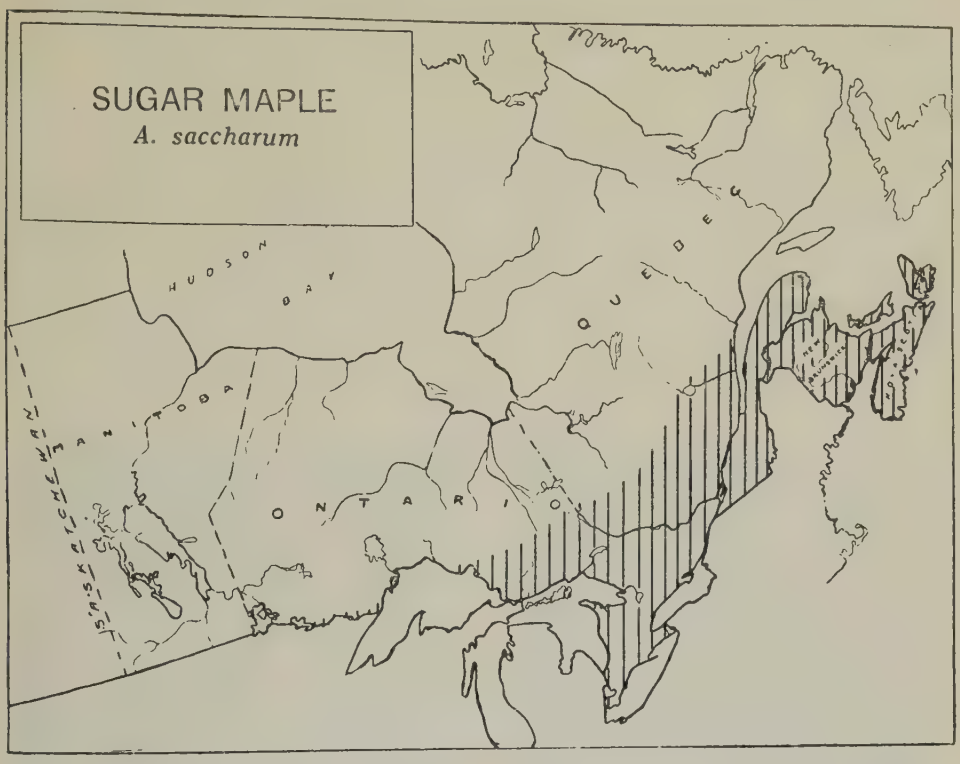
The twigs are a brighter red than the bark of the limbs and often slightly angled in cross-section.

The buds are bright red, sharp-pointed, and about $\frac{1}{8}$ in. long.

The leaves are from 1 to 5 in. long and three- to five-lobed. The lower two lobes (the pair nearest the stem) are sometimes separated from the others as in

a compound leaf. They are dark-green in colour and smooth and shiny on top. The veins are yellowish and the stems red.

The wings of the keys are very broad and slightly spreading. They are rose-red to light-brown in colour.



Acer saccharum Marsh. **Sugar Maple**

Other common names: Hard maple, rock maple.

French names: Érable à sucre, érable dur, érable piqué, érable moiré, érable ondé.

The sugar maple in the forest averages 80 to 90 ft. in height and 2 to 3 ft. in diameter. It is one of our tallest hardwoods, sometimes reaching the height of 130 ft. and 5 ft. in diameter.

The range of this maple is from Newfoundland westward to the lake of the Woods, but not north of the height of land dividing the watershed of the Great Lakes from that of Hudson bay.

The crown is spreading and dense unless crowded in a close stand. The root-system is shallow.

The bark on young trees is smooth and slightly furrowed. As the tree becomes older the bark ridges curl until on large trees the bark has a ploughed appearance, with smooth places between ridges.

The leaves, as is the case with all maples, come out in pairs opposite each other. There are five main lobes. The sinuses, or open spaces between the lobes, are rounded, and not narrow and pointed as with other eastern maples. The upper surface is dark-green and the under surface lighter. In the autumn the leaves turn crimson, scarlet, yellow or orange in colour.

The twigs, like the leaves, come out in pairs on opposite sides of the branch and are reddish-brown in colour. The winter buds are narrow, sharp-pointed, and brown, a feature by which the tree is readily distinguished from the other maples.

The fruits or keys develop from the end of the twig, while those of the red maple and silver maple come from the side.

The sugar maple requires moist, rich soil for its best development and will not do well on poor soil. It is found in pure stands or mixed with such other hardwoods as beech, oak, elm, basswood, and hickory. It is a slow-growing and long-lived tree. Its ability to endure heavy shading when young gives it an advantage over many other trees, and enables it to establish itself under conditions that they could not endure.

The sapwood of the sugar maple is of a light yellowish colour, while the heartwood varies from light reddish-brown to brownish-white.

The wood is of good weight (about 45 to 47 pounds per cubic foot air-dry) and is hard and strong. It is especially adapted for flooring by its quality of resistance to wear, its attractive light colour, and its capacity for high polish. It turns well, and is used extensively in furniture with various stains as well as with "natural" finish, where figured wood—the so-called "bird's-eye" and "curly" grain—presents very pleasing effects. It is used for veneer, vehicle stock, agricultural implements, and in most uses where a strong hardwood is required. The wood is consumed in large quantities for fire-wood and wood distillation. In diversity of uses it is rivalled by few native trees.

Photo. 10568. *B. R. Morton.*

Sugar maple (*Acer saccharum*): trunk and bark

Photo. 8366. *B. R. Morton.*

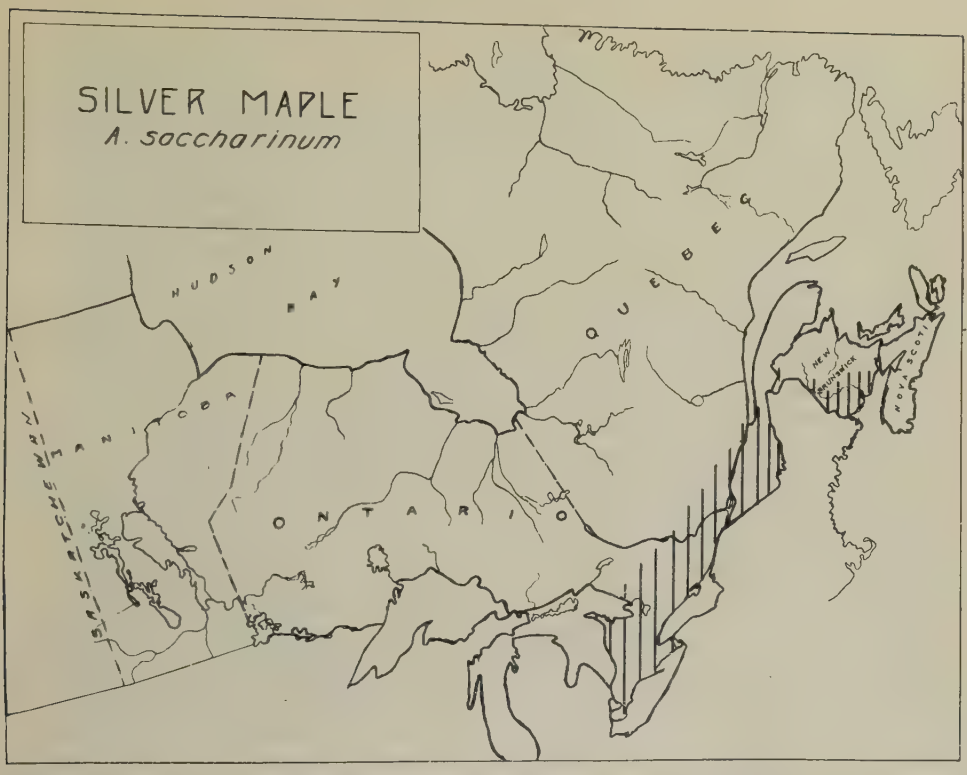
Silver maple (*Acer saccharinum*): trunk and bark

Acer saccharinum L. **Silver Maple**

Other common names: White maple, soft maple*, swamp maple*, river maple, water maple*, broad-fruited maple.

French names: Érable blanc, plaine blanche, érable à fruits cotonneux.

The silver maple is a tree averaging 80 to 90 feet in height and 2 to 3 feet in diameter, sometimes reaching 125 feet in height and 5 feet in diameter. It is one of our most rapidly growing hardwoods. Unless grown in a close stand the trunk divides near the ground into several stout, upright branches and forms a



medium-spreading head with drooping branches. The tendency for the small branches to grow downward and then turn up again is very characteristic, and is much more marked than with the red maple.

The bark is grey with a reddish tinge, and peels off from the trunk in older trees in long pieces, which are free at each end and attached at the middle.

The twigs, which come out in pairs and opposite, as with all maples, are curved and have a distinct odour when freshly cut. The buds are blunt-pointed and red, and more clustered than those of the red maple. It is one of the first trees to blossom in the spring.

The leaves are five-lobed and the sinuses or notches between the lobes are narrow and come to a sharp point. The notches are narrower than those of the red maple leaf. In autumn the leaves turn a dull yellow.

The wings of the seeds are very wide-spread, more so than those of either the sugar maple or red maple.

The silver maple ranges from New Brunswick westward through southern Quebec and southern Ontario and is found on deep, rich soils such as river bottoms and along the borders of swamps. It is usually mixed with other hardwoods.

The wood of the silver and the red maples is usually sold together as "soft" maple. It is not so strong as that of the sugar or "hard" maple, but is often used for similar purposes.

Acer rubrum L. **Red Maple**

Other common names: Soft maple*, scarlet maple, swamp maple*, water maple*.

French names: Érable rouge, plaine rouge, érable tendre.

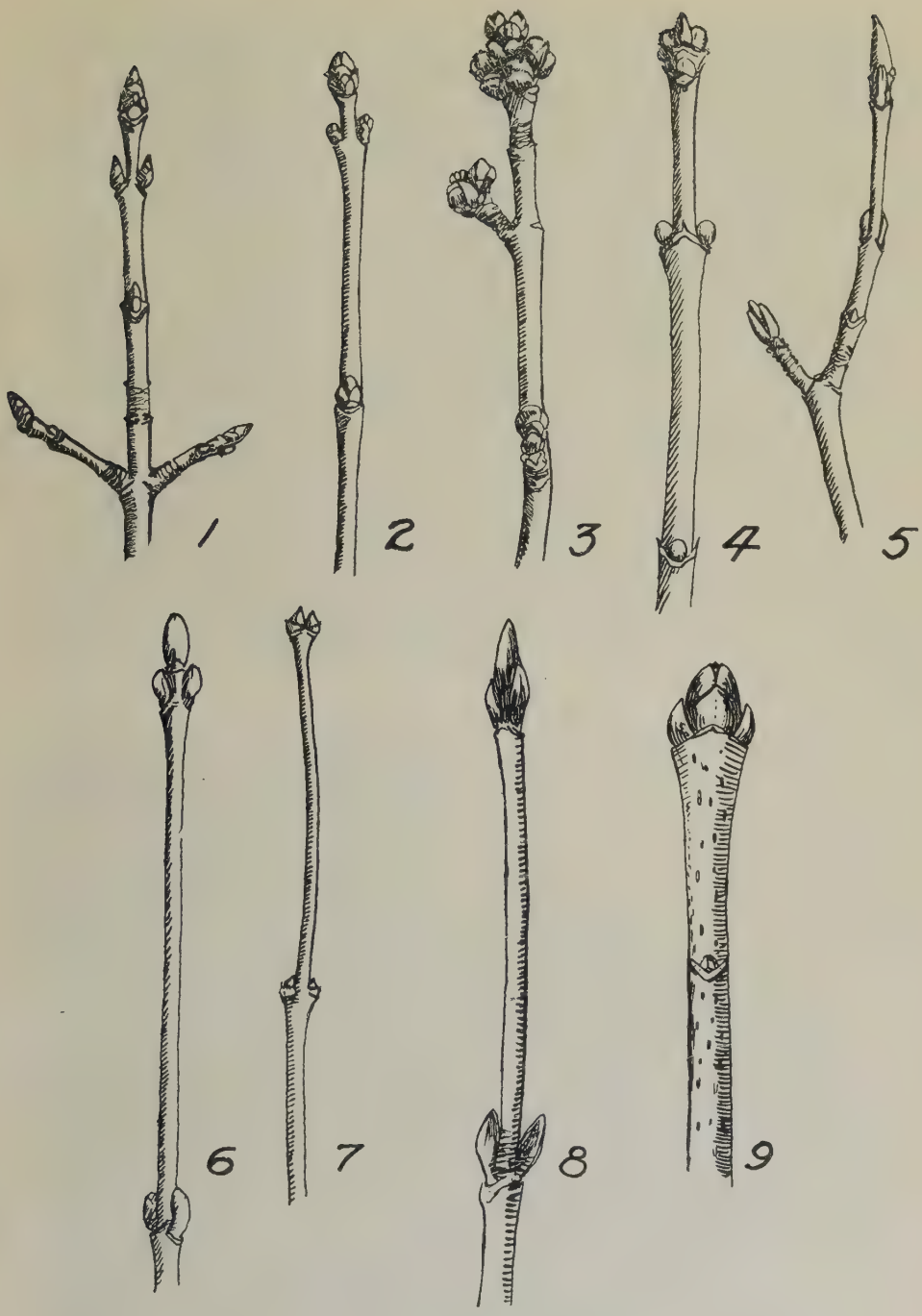
The name "red maple" is most appropriate for this tree. Its twigs, winter buds, and fruit, the stems of leaves and, in the autumn, the leaves themselves are all bright red in colour. It is one of the first trees to change its colour in autumn.

Photo. 11000. *R. H. Campbell.*

Silver maple (*Acer saccharinum*): summer condition

Photo. 6829. *B. R. Morton.*

Silver maple (*Acer saccharinum*): winter condition



MAPLE TWIGS

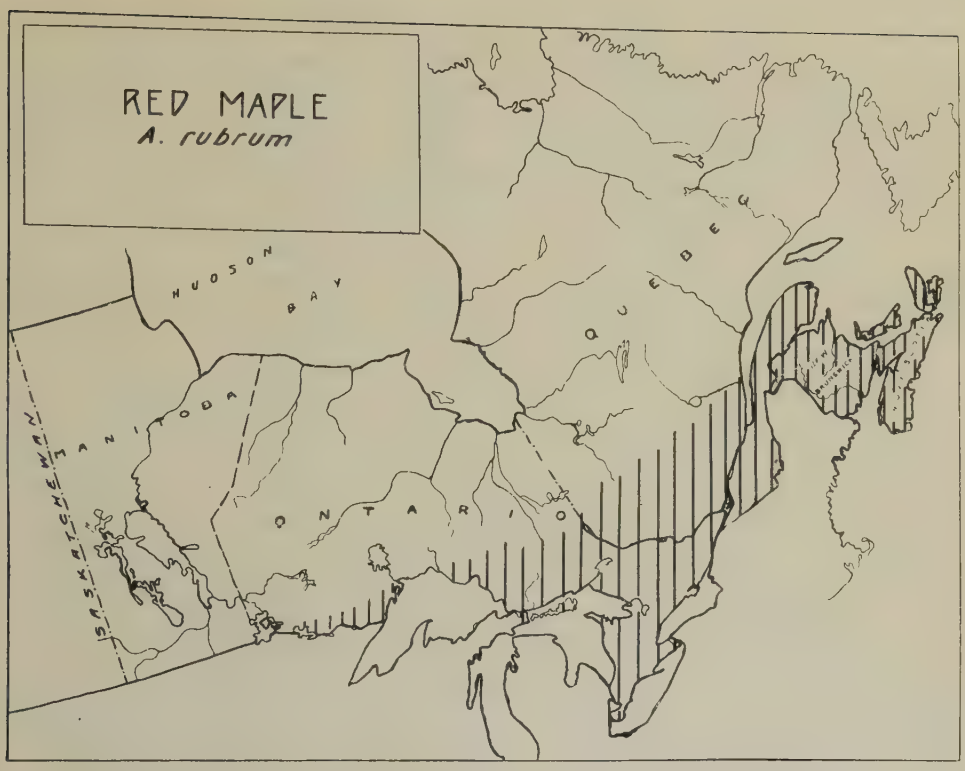
1 Sugar maple (*Acer saccharum*). 2 Red maple (*Acer rubrum*). 3 Silver maple (*Acer saccharinum*. 4 Manitoba maple (*Acer Negundo*). 5 Mountain maple (*Acer spicatum*). 6 Dwarf maple (*Acer glabrum* var. *Douglasii*). 7 Vine maple (*Acer circinatum*). 8 Striped maple (*Acer pennsylvanicum*). 9 Broad-leaved maple (*Acer macrophyllum*).

Photo. 10999. *R. H. Campbell.*

Sugar maple (*Acer saccharum*)

Photo. 8287. *B. R. Morton.*

Manitoba maple (*Acer Negundo*)



It attains a height of 70 to 90 feet with a trunk 3 to 4 feet in diameter. The main branches have an upright growth, the smaller branches and twigs spread out and tend to turn up towards the end.

The bark is smooth and grey on young trunks; when old it cracks and peels off in slender longitudinal flakes, which do not curl at both ends as in the case of the silver maple.

The leaves are five-lobed, the two at the base not being prominent. The sinuses or notches between the lobes are acute.

The buds are blunt-pointed and red; they are usually not so shiny as those of the silver maple, nor are there so many of them in a cluster. The flower buds open before the leaves, and it is one of the first trees to blossom in the spring. The fruit ripens in May.

It is found mostly on rich, moist lands, and along the borders of streams and swamps, where it makes rapid growth when young; on poor, dry soil it forms a scrubby growth. It ranges from Nova Scotia to the lake of the Woods in Ontario, but is nowhere plentiful in Canada.

The wood is somewhat softer and lighter than that of sugar maple, and is generally sold as soft maple with wood of silver maple (*Acer saccharinum*).

Acer Negundo L. **Manitoba Maple**

Other common names: Box elder*, ash-leaved maple.

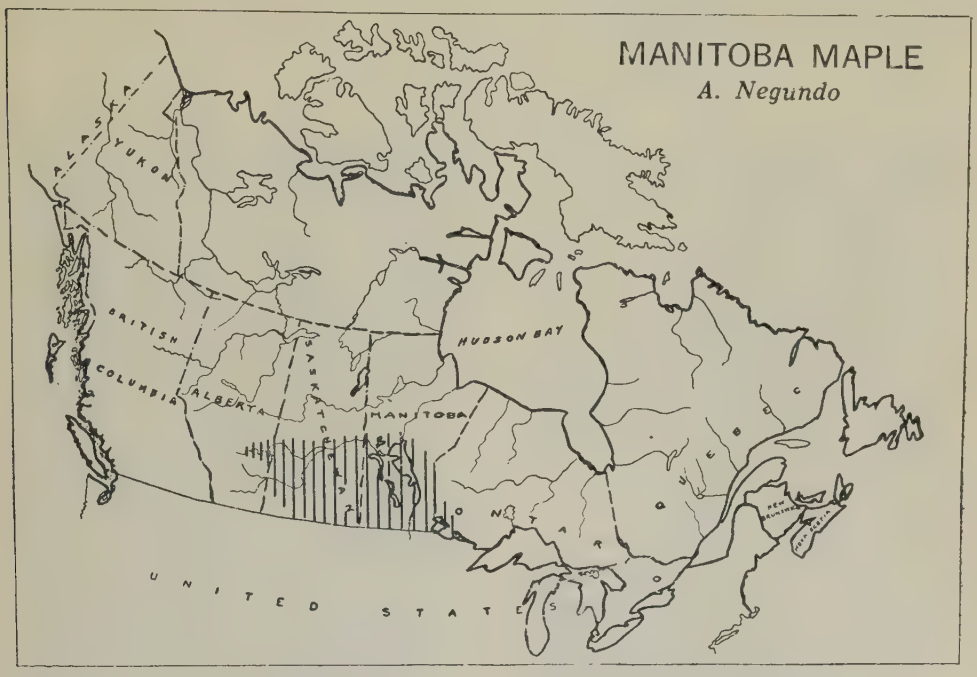
French names: Érable négundo, plaine à Giguère, érable à feuilles de frêne, aune-buis.

The Manitoba maple attains a height of 50 to 75 feet and a diameter of 2 to 3 feet, but usually is considerably smaller. The trunk is usually short and divides near the ground into several large, spreading branches.

MAPLES (*Acer*)

	SUGAR (*A. saccharum*)	RED (*A. rubrum*)	SILVER (*A. saccharinum*)	MOUNTAIN (*A. spicatum*)	STRIPED (*A. pennsylvanicum*)	BLACK (*A. nigrum*)	MANITOBA (*A. Negundo*)	BROAD-LEAVED (*A. macrophyllum*)	VINE (*A. circinatum*)	DWARF (*A. glabrum* var. *Douglasii*)
BARK	Very rough, on large trees it has a ploughed appearance. See black maple.	Peels in long flakes, but does not curl as a rule.	Peels in long vertical flakes which curl at either end and remain attached at the middle.	Thin and can be stripped off. Not marked like that of striped maple.	Smooth, with green stripes and vertical white cracks.	This is a variety of sugar maple with darker bark.	Furrows deep. Ridges irregular and flat-topped.	Furrows deep. Ridges broken into square scales.	Thin and smooth with shallow fissures.	Smooth and thin with a reddish tinge.
TWIGS	Reddish-brown twigs covered with pale dots.	Twigs very red, dotted with brown. Curving of the branches not so marked as in silver maple.	When freshly cut twigs have a distinct odour. Branches sweep down and curve up at the end.	Covered with a fine bloom,	No bloom on twigs. Often striped. Distinct ridges above the leaf-scars.		Coarse. Reddish-purple to yellowish-green. Covered with bloom. Leaf-scars on opposite sides extend around the twig and almost meet.	Green or dark red and covered with pale dots.	Sometimes covered with bloom.	Twigs slightly angled in cross-section.
BUDS	Sharp-pointed, narrow and brown. Larger number of scales than those of other maples. See black maple.	Blunt-pointed and red. See silver maple.	Like those of red maple but more shiny. Usually more buds in a cluster than with red maple.	Stalked, pointed, somewhat downy, and red to green in colour.	Stalked, blunt, rose-coloured and somewhat four-sided in cross-section.	Darker than those of sugar maple.	Grey and downy. Two pairs of scales visible.		1/8 in. long, red and blunt-pointed.	1/8 in. long, red and sharp-pointed.
LEAVES	Five-lobed. Notches between the lobes rounded. Margin not finely toothed as with other maples of Eastern Canada. See black maple.	Five lobes, but the two at the base not prominent. Notches between the lobes sharp. See silver maple.	Five-lobed. Notches between the lobes sharp or rounded but deeper and narrower than the red maple.	Three shallow lobes as a rule. Coarsely toothed. Thin and papery in texture. See striped maple.	Three-lobed; somewhat like a goose's foot in outline. Finely toothed larger than those of mountain maple.	Like those of the sugar maple except that they have a somewhat wilted appearance owing to the margins being more or less curled. Lower lobes often not so prominent as in sugar maple.	3 to 5 or 7 oval coarsely-toothed leaflets on one stem.	Five-lobed. Notches deep, narrow and rounded. Margin toothless. 7 to 14 in wide, with very long stems.	7 to 9 sharp-toothed lobes. Circular in general outline.	3 to 5 lobes, the lower two sometimes separated from the middle one. Leaf stem red.
FRUIT	Wings spread at something less than a right angle. Develops from a bud at the end of the twig.	Bright red in colour. Develops from a bud at the side of the twig.	Seeds large with wide spreading wings. Larger than those of red maple. Develops from a bud at the side of the twig.	Pit-like depression on one side of the seed. See striped maple.	Pit-like depression on one side of the seed but wings wider spread than those of the mountain maple.		Seeds join to form an acute angle. Hang in clusters on the trees well into the winter.	Seed is covered with bristle-like hairs.	Thin, red, and wide-spreading wings. Wings about 1½ in. long.	Red but less spreading than the vine maple. Wings about ¾ in. long.

This tree is fond of moist soils and is usually found growing along streams and margins of lakes. It can, however, withstand considerable drought. Its rapidity of growth and hardiness against freezing has made it very popular for shelter-belt planting on the prairies. It is also extensively used as a shade tree in the towns and cities of the Prairie Provinces, where it is native. It is not found growing naturally in Eastern Canada. It is, however, extensively planted in the East because of its rapid growth, but otherwise it is not a desirable tree for Eastern Canada, where there is no difficulty in growing better and longer-lived trees.



The bark is light brown in colour, and on old trees is thick and deeply furrowed with irregular, flat-topped ridges.

The twigs are smooth and either reddish-purple or yellowish-green in colour. In winter they are covered with a down or bloom which rubs off. The leaf-scars are somewhat V-shaped and, as with all maples, are in pairs and opposite on the twig. Adjacent leaf-scars extend around the twig and almost meet.

The winter buds are grey and downy, sometimes reddish. Only two pairs of scales are exposed.

The leaves are compound, *i.e.*, they have several (three to five or more) leaflets on a stem. This is the only native maple with compound leaves. The leaflets are 2 to 4 inches long, oval in outline, and coarsely toothed. They are light green above and pale beneath.

The fruit hangs in clusters from a stem 6 to 8 inches long and remains on the tree well into the winter. The wings are spread at a sharp angle. The seed portion, even when quite fresh, has a more or less withered and wrinkled appearance.

The wood of this species is lighter in weight than any of the other maples that furnish commercial timber. It is used locally for boxes and rough construction.

Acer nigrum Michx. **Black Maple**

French name: Érable noir.

The black maple is found in the valley of the St. Lawrence in the vicinity of Montreal and in southern Ontario.

It is sometimes considered merely a variety of the sugar maple (*A. saccharum*), and has the same broad characteristics in height and diameter and shape of crown, as well as in the bark.

The leaves are less distinctly 5-lobed, sometimes only 3-lobed, and have fewer teeth than the sugar maple. A very characteristic feature is the dense coating of velvety brown hairs on the under surface of the leaf and on the leaf stalk.

The wood has the same character and uses as that of the sugar maple.

Photo. 8288. *B. R. Morton.*

Manitoba maple (*Acer Negundo*): trunk and bark

Photo. 8621. *B. R. Morton.*

Flowering dogwood (*Cornus florida*): trunk and bark

THE DOGWOODS

There are about fifty species of dogwood (*Cornus*) and all are distributed throughout the temperate regions of the northern hemisphere, with the exception of one species in Peru. Most of them are shrubs or small trees and they are unimportant except for their high decorative value.

A dozen or more species occur in Canada, but only four, since they sometimes attain tree size, need be mentioned here. They are *Cornus florida, Cornus asperifolia, Cornus alternifolia* and *Cornus Nuttallii*. The last mentioned is the only one of the four found on the Pacific coast. All of them except *C. alternifolia* produce their leaves and twigs in pairs from opposite sides of the branches.

The wood is hard, heavy, and strong, and suitable for small turnery, but the trees are too small to be of much commercial importance.

DOGWOOD FLOWERS AND LEAF

1 Flowering dogwood (*Cornus florida*) leaves. 2 Flowering dogwood (*Cornus florida*) flower. 3 Western dogwood (*Cornus Nuttallii*) flower.

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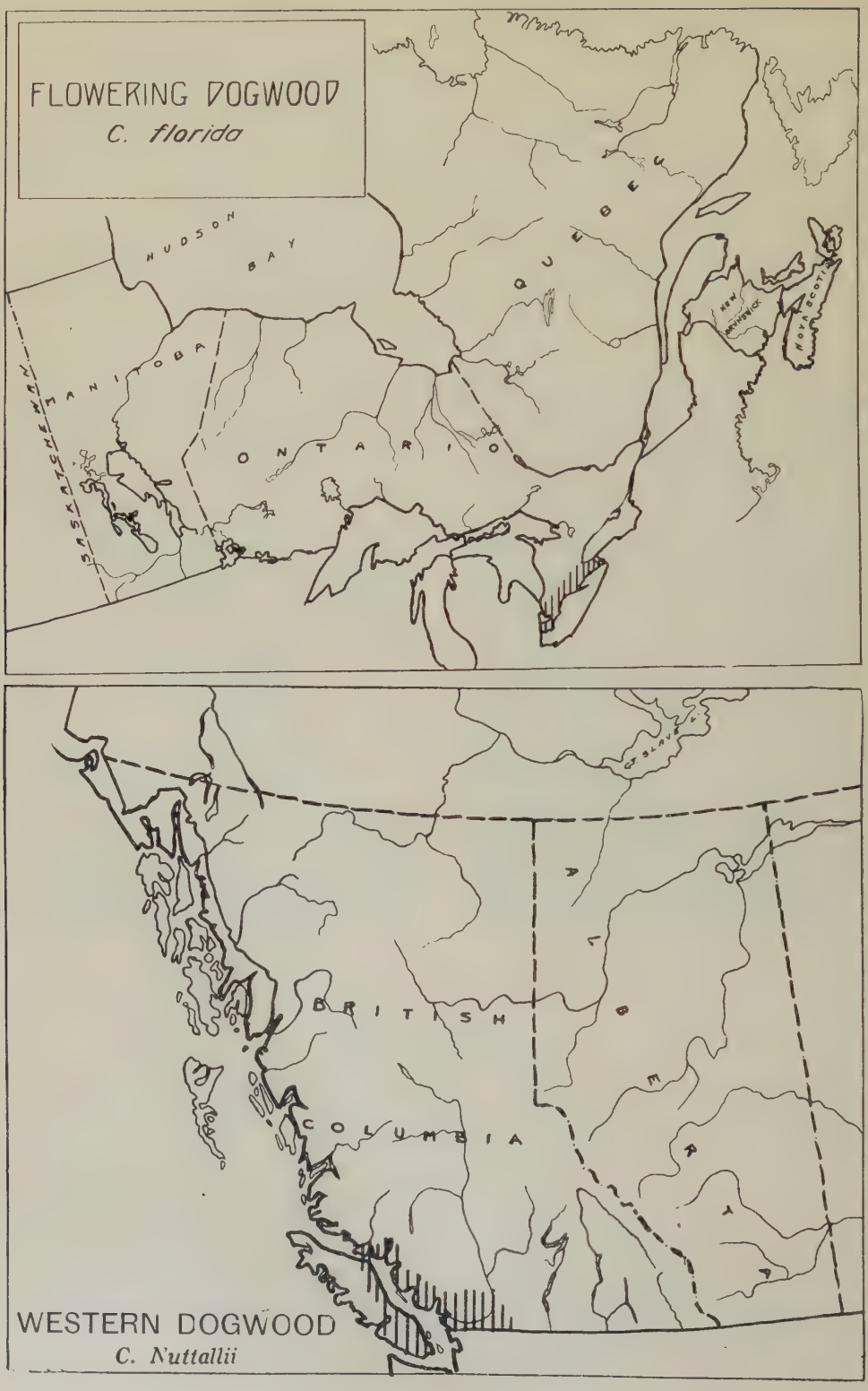

FLOWERING DOGWOOD
C. florida
HUDSON BAY
ONTARIO
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA
BRITISH COLUMBIA
WESTERN DOGWOOD
C. Nuttallii

Cornus florida L. **Flowering Dogwood**

Other common names: Red willow*, red osier*, boxwood*.
French names: Cornouiller de la Floride, bois de flèche.

The flowering dogwood is found in the Niagara district of Ontario, and westward to lake St. Clair.

It is a small tree or shrub found growing in woodlands, often planted for ornamental purposes on account of its flowering habit.

Its twigs and leaves are opposite, i.e., they come out in pairs from the opposite sides of the branch, as do those of the maples and ashes. The single pair of scales on the terminal bud of the twig and the presence of many large top-shaped flower buds will distinguish it from any of the maples or ashes during the winter.

The bark is dark-brown and on large stems is broken into small, squarish plates. The twigs are slender, smooth, and bright red in colour. When chewed they are bitter.

The leaves are 3 to 5 in. long, oval to almost round in outline, with smooth or slightly wavy margins. The ribs above are indented and whitish and curved to follow the general outline of the leaf. The leaves are usually clustered at the ends of the twigs.

The flowers are large, white, and very showy, making the plant a conspicuous object in the spring.

The fruit, which grows in clusters and ripens to a bright red colour in the autumn, is oblong, fleshy, and berry-like, and contains a grooved stone.

The wood is heavy, fine-textured, and homogeneous so that it withstands abrasion and wears smooth under friction. It is cut for special uses—mostly from its fairly wide range in the southern states. Shuttles are made altogether of this wood and of persimmon. It is a substitute for Turkish boxwood for spindles, bobbins, mallets, and tool-handles. When of sufficient size it is used for golf-club heads, although persimmon has largely replaced it for this purpose.

Cornus Nuttallii Aud. **Western Dogwood**

French name: Cornouiller de Nuttall.

The western dogwood is found in the lower Fraser valley, and on Vancouver island in British Columbia. It is a small tree, commonly 20 to 25 ft. in height and 6 to 7 in. in diameter, though occasionally 60 ft. high and 18 in. in diameter. In the spring the large, showy, petal-like bracts around its flower clusters make it a conspicuous object.

In general appearance it resembles the flowering dogwood (*Cornus florida*) of the East, but is readily differentiated from it by the differences in range and by the shape of the flower scales, which in the case of the western species are pointed at the tip, while those of the other are indented at the end and are on the whole more heart-shaped. Western dogwood is recognized by horticulturists as the most valuable ornamental species of its genus, but is only half-hardy outside its native zone.

While the wood is heavy, hard, fine-textured, and generally similar to the eastern species, the limited supply in Canada makes it of little commercial value at the present time.

THE BLACK GUM

Five species of the genus *Nyssa* are recognized. Four occur in the eastern portion of this continent and one in China. Only one, *Nyssa sylvatica*, extends sufficiently far north to come into Canada. The gum trees are fond of damp situations and are usually found in swamps.

They can be recognized by their oval leaves with their toothless margins and smooth, shiny surfaces, and by their characteristic fruit.

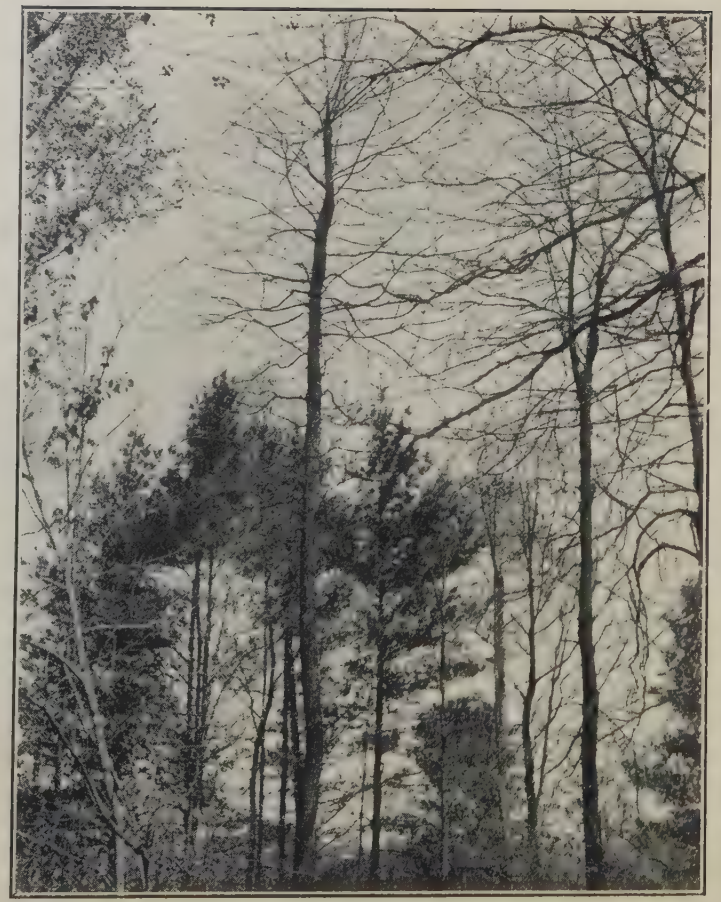
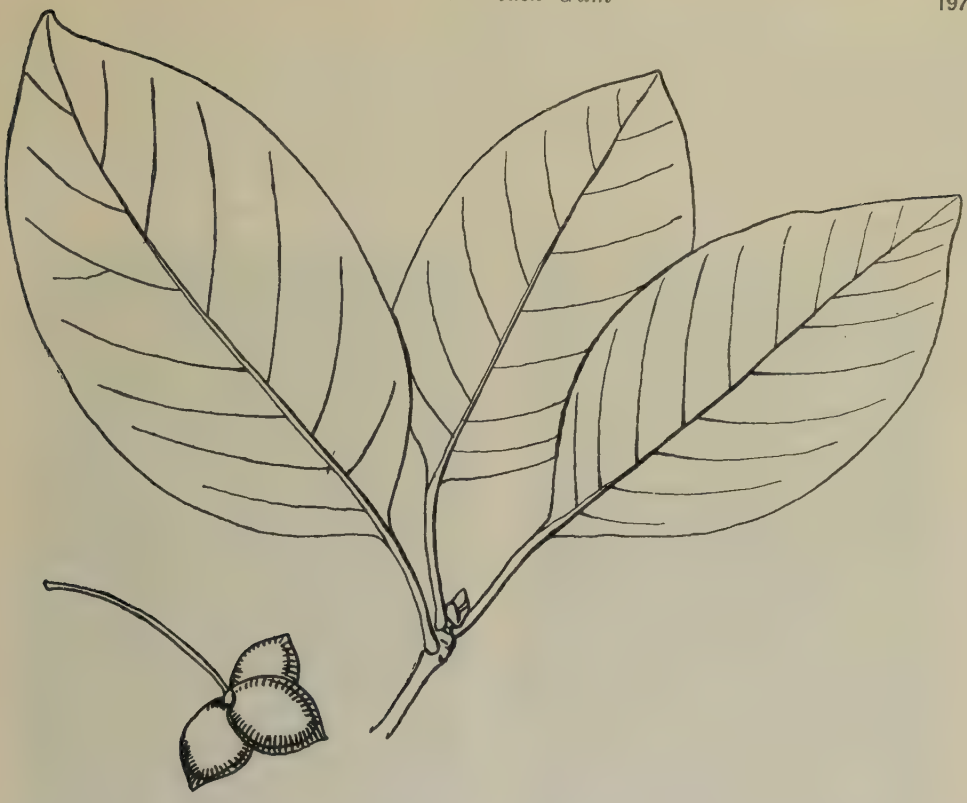


Photo. 8577. B. R. Morton.

Black gum (*Nyssa sylvatica*)

Photo. 8749. B. R. Morton.

Basswood (*Tilia glabra*)



Black Gum (*Nyssa sylvatica*): leaf and fruit

Nyssa sylvatica Marsh. **Black Gum**

Other common names: Sour gum, pepperidge, tupelo.
French name: Nyssa sylvestre.

The Canadian range of the black gum is limited to the southwestern part of Ontario, bordering on lakes Erie and St. Clair, where it is found growing in swamps and along the edges of streams.

It is a large tree, averaging 60 feet in height. In the forest the trunk is symmetrical and clear for a considerable length. The crown in old trees is often flat-topped and frequently stag-headed, i.e., dead at the top. In the open, the branching is very irregular, the lower branches drooping more or less and the upper ones growing out horizontally.

The bark is dark-grey tinged with red, rough, deeply grooved, and broken by cross-lines into many-sided plates.

The twigs are slender, smooth, reddish-brown, and numerous, and have a horizontal, spreading habit of growth. The small branches are frequently covered with many, short, spur-like growths which are roughened by broad, crescent-like leaf-scars.

The winter buds are about $\frac{1}{4}$ in. long, dark-red, blunt-pointed, and usually pointed well away from the twig.

The leaves are 2 to 5 in. long, oval in outline, and leathery in texture. They are dark-green and shiny above and often fuzzy beneath. The margin is smooth, not notched, and the stem is slender, sometimes short and stout, and very often red.

The fruit is berry-like, blue-black in colour, and sour to the taste. It is about $\frac{2}{3}$ in. in length and contains a more or less ridged stone. There are one to three of these fruits on a single stalk.

The wood is light-coloured, homogeneous, and moderately heavy. It is seldom produced in Canada, but in the United States it finds considerable use, where its qualities of resistance to wear or splitting are important. It takes finishes well and is used considerably for interior trim and moulding and paint or enamel coatings.

For illustration of the twigs and winter buds of this species, see the second of the plates "Miscellaneous Twigs" at the end of this volume.

Photo. 8578. B. R. Morton.

Black gum (*Nyssa sylvatica*): trunk and bark

Photo. 8748. B. R. Morton.

Basswood (*Tilia glabra*): trunk and bark

THE BASSWOOD OR LINDEN

About twenty species of linden (*Tilia*) are found throughout the world. Six are native to North America, of which one occurs in Canada. They are much used for ornamental planting, particularly in Europe, and a number of European species have been introduced into this country for that purpose.

The wood is soft, light, uniformly fine in texture, and straight-grained, but is not very resistant to decay.

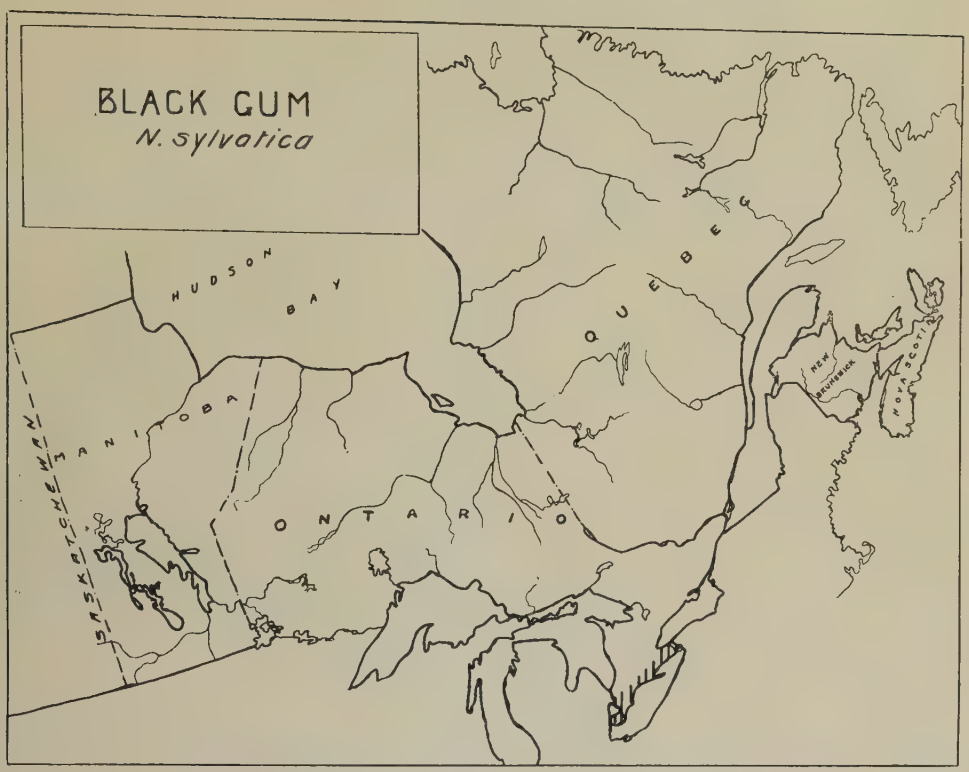
Tilia glabra Vent. **Basswood**

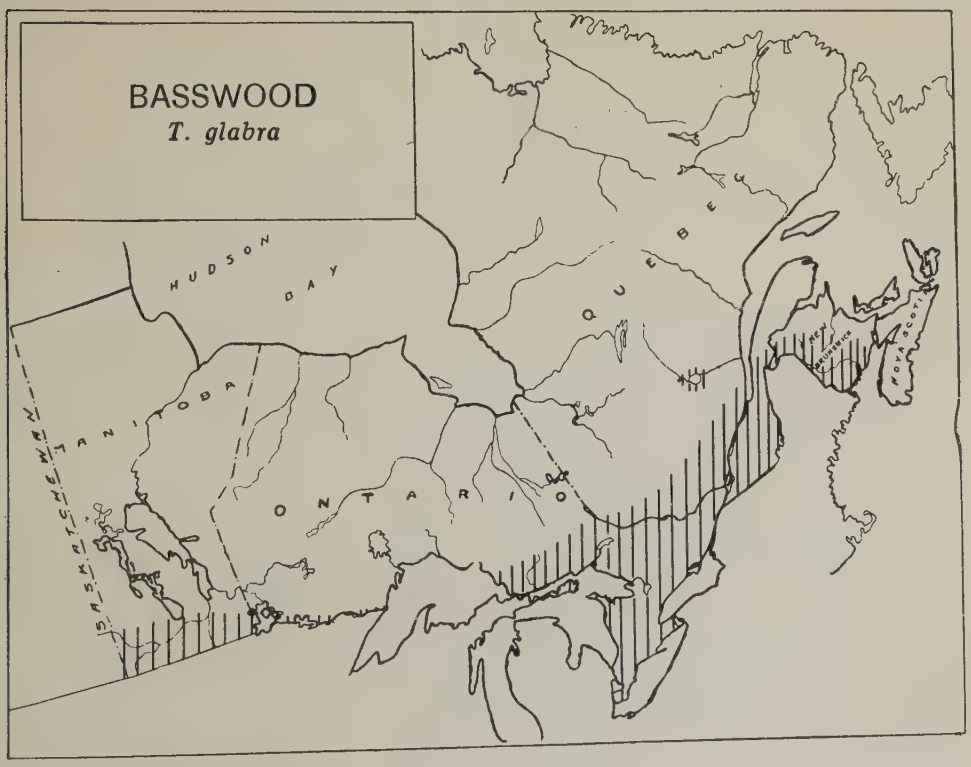
Other common names: American linden, lime tree, whitewood*.
French names: Tilleul d'Amérique, bois blanc*.

The basswood is found from the Atlantic coast westward to southern Manitoba, growing in rich, loamy soil in woods and pastures.

It is commonly 60 to 70 ft. in height, but sometimes over 100 ft. high and 4 ft. in diameter. The trunk is erect and the narrow, oblong or pyramidal head is composed of many small branches. The lower branches are sometimes drooping.

The bark is dark grey, thick, tough, and deeply furrowed. The inner bark is very tough, fibrous, and mucilaginous.


BLACK GUM
N. sylvatica
HUDSON BAY
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA


BASSWOOD
T. glabra
HUDSON BAY
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEW BRUNSWICK
NOVA SCOTIA

Basswood (*Tilia glabra*): leaf and fruit

Madrona (*Arbutus Menziesii*): leaf

The twigs are slender and have a more or less zigzag growth. They are smooth, shiny, and either greenish or reddish in colour.

The winter buds are dark-red, sometimes green, smooth, pointed, and lop-sided. These one-sided buds are one of the tree's best distinguishing points in winter.

The leaves are very large, 5 to 6 in. long, heart-shaped in outline, and somewhat one-sided. The margin is irregularly toothed with fine and coarse points, and the veining in the back is conspicuous, with small tufts of brown hair at the junction of the veins.

The fruit is in the form of tiny, round, and woody balls, which look like peas, and which are attached singly or in clusters, by means of a common stalk, to the centre of the midrib of a narrow, leaf-like bract.

Basswood lumber is the most important of what might be called the "soft hardwoods" (broad-leaved trees with soft wood) that are produced in Canada. It is a light-coloured, uniform wood of fine texture and without figure. It is well suited for paint and enamel finish. Its easy working qualities and uniformity fit it for a variety of exacting uses in furniture, interior finish, and cabinet work. It is a favourite wood for core-stock, panels and veneer, and, in fact, wherever stability is required in a soft homogeneous hardwood. An outstanding specialty use of this wood is for cigar-boxes.

For illustration of the twigs and winter buds of this species, see the first of the plates "Miscellaneous Twigs" at the end of this volume.

THE MADRONA

Twelve species of madrona (*Arbutus*) are known to exist either as small trees or as shrubs. Three occur as trees in the United States, but only one of them extends north far enough to come into Canada.

All of them have thin, smooth bark—bright red on twigs and branches—and thick, leathery, evergreen leaves. They produce fairly heavy, fine-textured hard wood that makes good charcoal and fuel.

Arbutus Menziesii Pursh — **Madrona**

Other common names: Manzanita, arbutus.
French name: Arbousier de Menzies.

The madrona reaches the northern limit of its range in southern British Columbia, where it is found on both sides of the straits of Georgia and on the islands therein, as far north as Bute inlet on the mainland.

The madrona is commonly a low, shrubby tree with twisted trunk and branches, but in favourable situations it is frequently found up to 2 feet in diameter, with a fairly straight trunk up to 80 feet tall.

The tree is readily distinguished by its shiny foliage, which remains green all winter. It is the only broad-leaved tree native to Canada that is an evergreen. The leaves are 2 to 5 in. long, shiny above and whitish beneath, smooth, thick, and leathery.

The fruit is spherical, berry-like in appearance, bright red in colour, dry, and mealy, and contains many small seeds. Great numbers of these fruits ripen in the autumn.

The wood is heavy, fine-textured, and hard. Owing to the limited distribution it is not used commercially in British Columbia. Farther south it reaches commercial size and is sometimes used for flooring, interior finish, turnery, and various specialties.

THE ASHES

There are about forty species of ash (*Fraxinus*) found throughout the world. Sixteen species occur in North America and of these four are found in Canada. Of the native species all are eastern trees, one extending as far west as lake Winnipeg. A fifth ash, a variety of one of the eastern species, is found throughout the prairie region.

The winter buds, leaves, and twigs of all the ashes come out in pairs from opposite sides of the branch. In this respect they resemble the maples and certain dogwoods, but the difference in fruit and leaves will readily distinguish them from these trees. The so-called mountain ash (*Sorbus americana*) is not a true ash and has not this opposite branching.

The wood of the different ashes is noted for its toughness and elasticity, but great differences exist among the five native species. The more valuable species are used for vehicle stock, tool-handles, and interior finish.

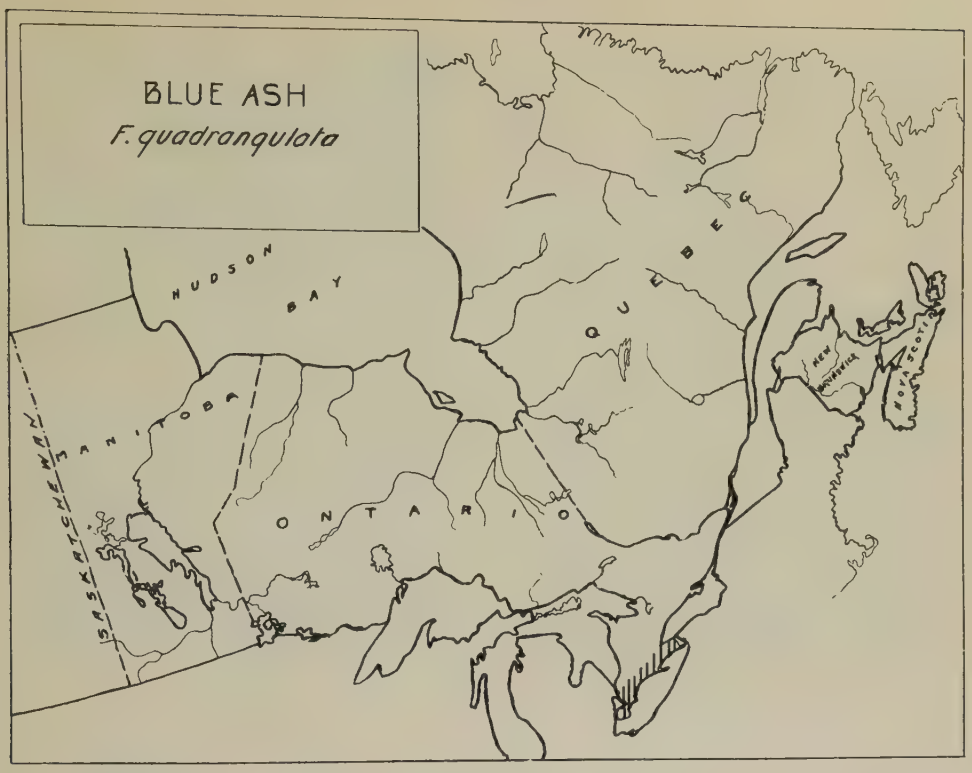
Fraxinus quadrangulata Michx. **Blue Ash**

French name: Frêne anguleux.

The blue ash is confined to southwestern Ontario in the counties bordering on lakes Erie and St. Clair, but is not very common even there. Under favourable conditions it reaches a height of 60 to 70 ft. and over, but commonly is considerably less. The scarcity of this species makes it of very little commercial importance in Canada.

The bark is light-grey and broken into thin scales. When cut it exudes a resinous juice, which turns bluish on exposure.

The branchlets are rather heavy and more or less four-sided in cross-section. This enables it to be distinguished from the other ashes. The winter buds are reddish-brown and slightly hairy.



The leaf, like that of all ashes, is compound, i.e., made up of several smaller leaflets. The leaflets have very short stems, and the underside of their midrib is hairy. The margin of the leaflets is notched with many incurved teeth.

The wing of the seed resembles very much that of the black ash. It is very wide, blunt, notched at the end, and practically surrounds the seed portion.

Fraxinus nigra Marsh. **Black Ash**

Other common names: Swamp ash, water ash, brown ash (Maritime Provinces), hoop ash.

French names: Frêne noir, frêne à feuilles de sureau.

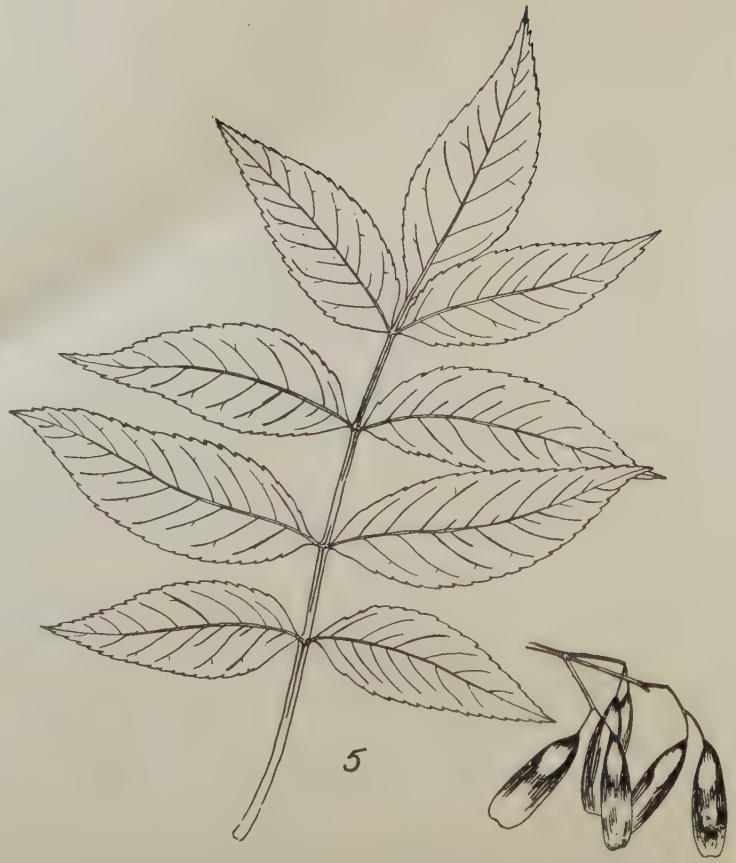
In Canada the black ash is distributed from the gulf of St. Lawrence to Manitoba and is found growing in river bottoms and swamps.

It is a tall, slender tree, from 60 to 70 ft. in height, with a narrow crown of upright branches. The diameter of the trunk is small for a tree of its height, and the taper is very slight.

The bark is thinner than that of the white ash and not so deeply furrowed. It is soft and scaly, i.e., it crumbles somewhat when the surface is rubbed with the palm of the hand, and a distinct mark is left where the rubbing was done. That of the white ash is harder and the mark is not so apparent.

The twigs are coarse, smooth, and, as with all other ashes, come out in pairs from the opposite sides of the branch. They are not pinched or flattened at the bud, as are those of the white ash. The upper margin of the leaf-scars is somewhat raised or extended to partly cover the winter bud.

The winter buds are very dark, almost black. They are narrower and more pointed than those of the white ash. The leaves, like those of all our ashes, are compound, i.e., they are formed of numerous smaller leaves. They are composed of from seven to eleven leaflets. The leaflets themselves, except the end one, are stemless and their margins only slightly toothed.



Blue ash (*Fraxinus quadrangulata*) leaf and fruit

ASH LEAVES

Black ash (*Fraxinus nigra*) leaf and fruit

Photo. 8615. *B. R. Morton.*

White ash (*Fraxinus americana*): trunk and bark

Photo. 8588. *B. R. Morton.*

Black ash (*Fraxinus nigra*): trunk and bark

Photo. 8292. *B. R. Morton.*

Red ash (*Fraxinus pennsylvanica*): trunk and bark

Photo. 10203. *B. R. Morton.*

Green ash (*Fraxinus pennsylvanica* var. *lanceolata*): trunk and bark

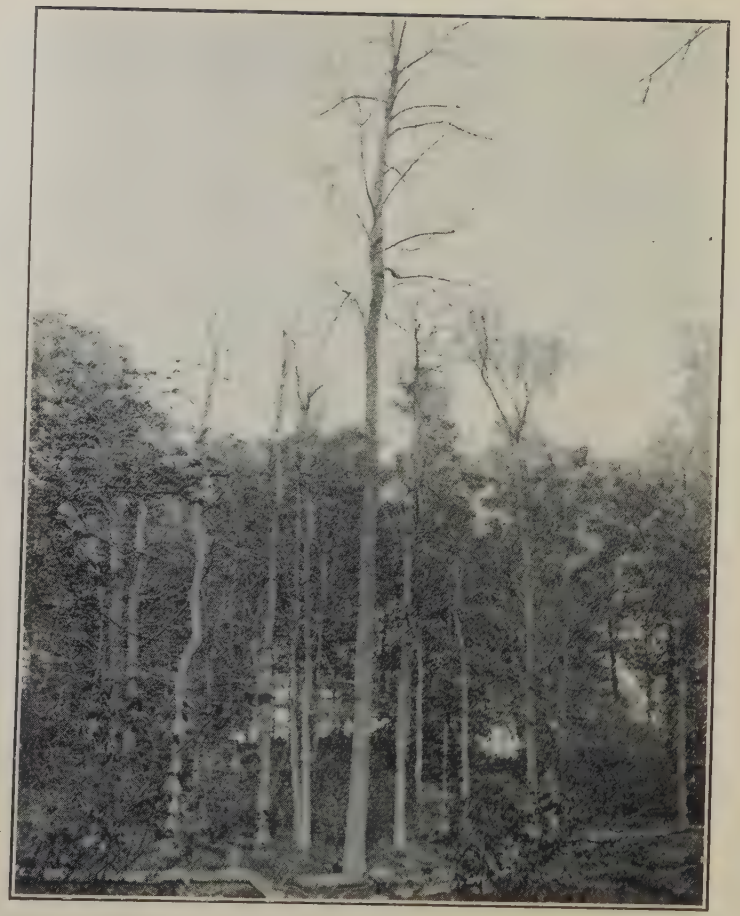
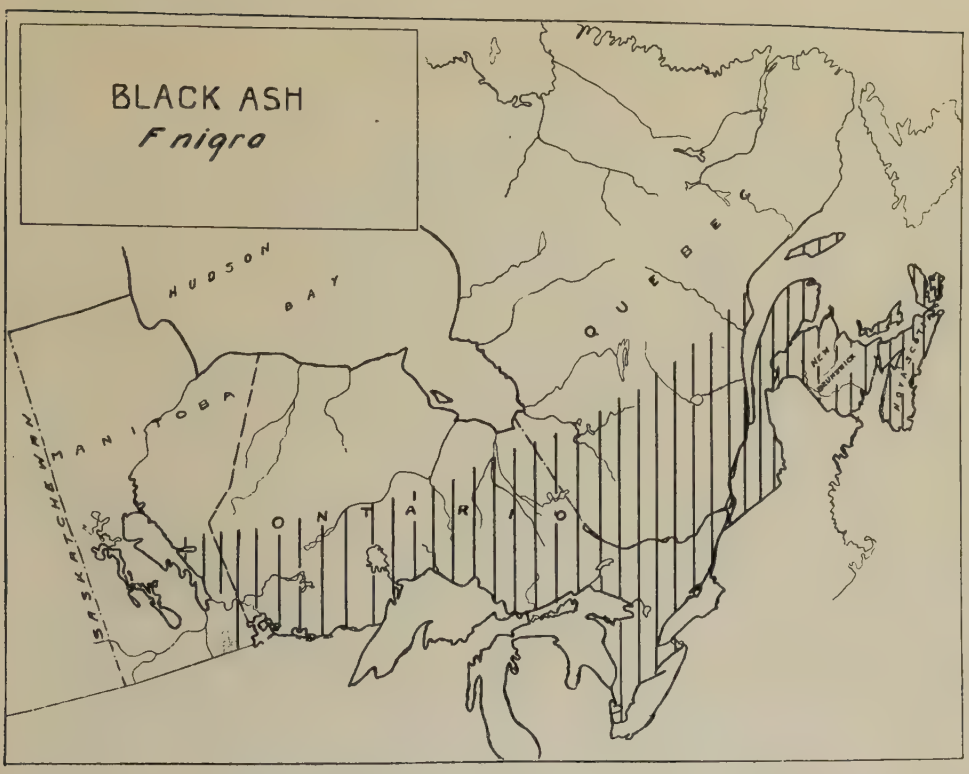


Photo. 8582. *B. R. Morton.*

White ash (*Fraxinus americana*)

Photo. 8589. *B. R. Morton.*

Black ash (*Fraxinus nigra*)



The fruit is a winged seed from 1 to 1½ in. long. The seed is somewhat flattened in cross-section and almost entirely surrounded by the wing. The ends of the wings are squarish and usually notched.

The wood of the black ash is softer and weaker than that of the white ash and is usually employed for more decorative purposes. It has an attractive growth-ring figure and can be stained to imitate more expensive woods. It is used in greatest quantities for interior finish, fixtures, and cabinet work.

Fraxinus americana L. **White Ash**

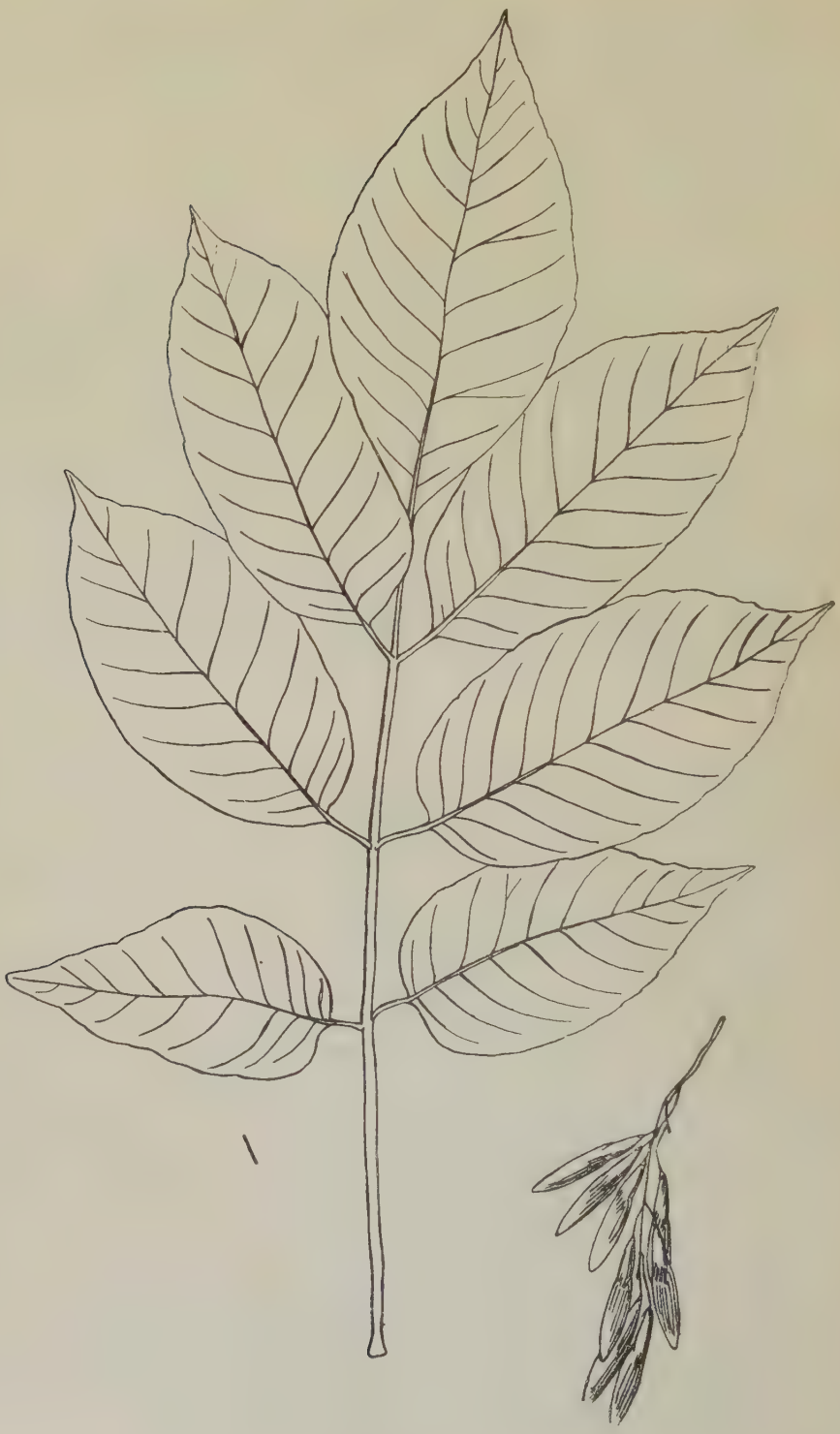
Other common names: Canadian white ash, American ash.
French names: Frêne blanc, franc frêne.

In Canada the white ash is distributed from Nova Scotia to southwestern Ontario, and is found growing on rich, moist soils but not in wet situations.

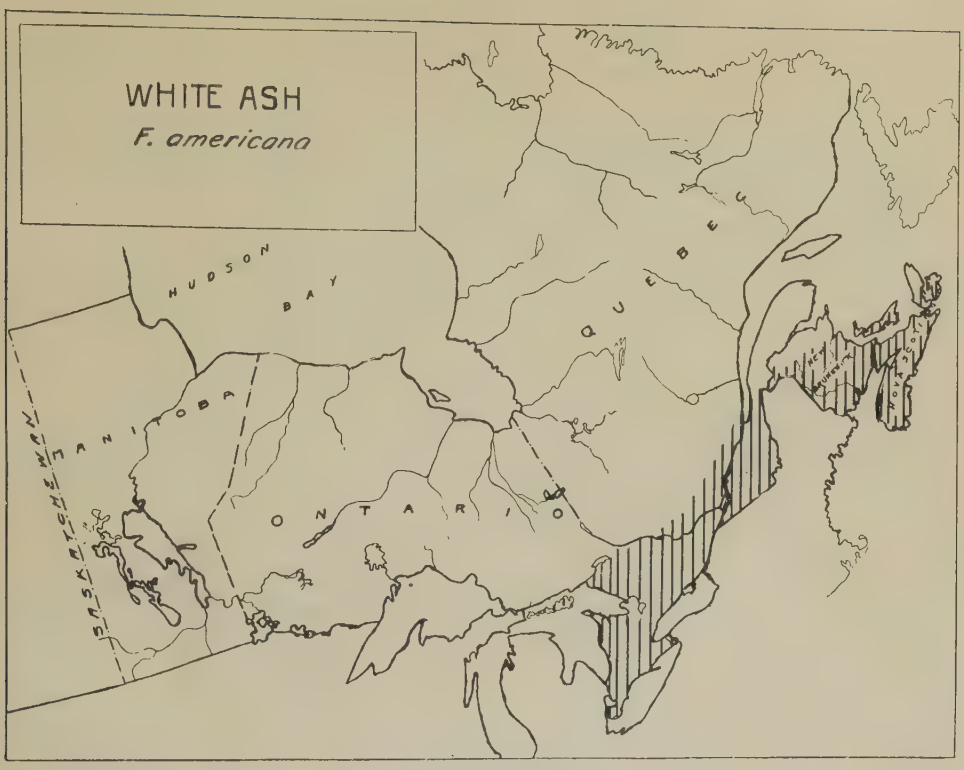
It is a large tree, commonly 50 to 60 feet in height and with a diameter of 2 to 3 feet, but when growing in a close stand sometimes reaches a height of 100 feet. The trunk is tall and straight and, even when growing in the open, rises to a comparatively good height before dividing.

The bark is grey and thick and on the trunk deeply furrowed into narrow, flattened, interlacing ridges.

The twigs are coarse and shiny, not downy as with the red ash. They come out in pairs from opposite sides of the larger twigs and branches (a feature common to all ashes and maples). Those of the white ash, however, stand out at a wider angle than most of our native ashes and this gives them a cross-shaped appearance. They are somewhat pinched or flattened at right angles to the bud. The upper margin of the leaf-scar nearly surrounds the bud. The winter buds are large, rusty-brown, and smooth.



White ash (*Fraxinus americana*) leaf and fruit



The leaves are compound, i.e., made up of several small leaflets. The leaf is 8 to 12 inches long and composed of seven or nine leaflets 3 to 5 inches long. The leaflets have stems; those of the black ash, with the exception of the end one, are practically stemless. They usually have a smoother margin than those of any of the other native eastern ashes.

The fruit is a winged seed that grows in clusters. The seed portion of the fruit is round in cross-section. The wing is narrow, wedge-shaped, more or less pointed, and not notched at the end, as a rule.

White ash wood is valued chiefly on account of its toughness and elasticity. It is used in the framework of light vehicles, cars, and agricultural implements, in aeroplane construction, skis, and for long-handled tools. The wood is also used for barrels, boxes, and veneer baskets for foodstuffs, because of its additional quality of tastelessness and freedom from odour. It has a wide variety of uses depending on these technical qualities.

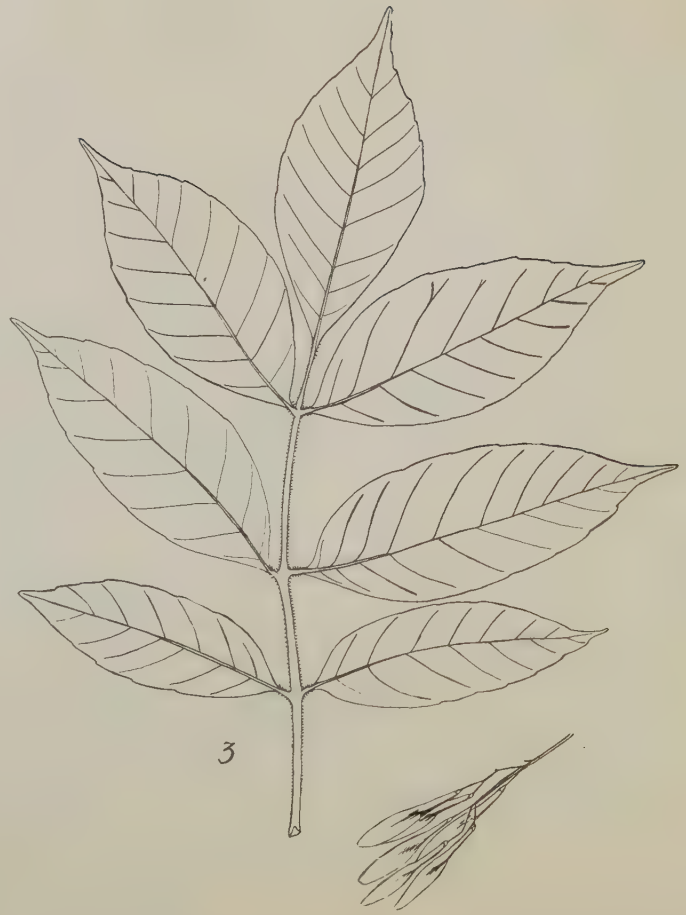
Fraxinus pennsylvanica Marsh. **Red Ash**

Other common names: Soft ash, river ash, rim ash.
French names: Frêne rouge, frêne pubescent, frêne de savanne.

The red ash is found sparingly in Canada from southwestern Quebec throughout southern Ontario. It is also reported in Manitoba near lakes Winnipeg and Winnipegosis and in the eastern portion of Saskatchewan, along the river bottoms. It is confined mostly to the banks of streams and margins of swamps, but will grow in dry localities.

It is a small tree, commonly 40 feet high, which in general appearance resembles the white ash. The fissures of the bark, however, are somewhat finer. The inner bark has a reddish tinge.

The twigs, which, as a rule, are downy, are one of its best distinguishing features. They are finer than those of the white or black ashes and heavier



Ash Leaves

3 Red ash (*Fraxinus pennsylvanica*): leaf and fruit.

4 Green ash (*Fraxinus pennsylvanica* var. *lanceolata*): leaf and fruit.

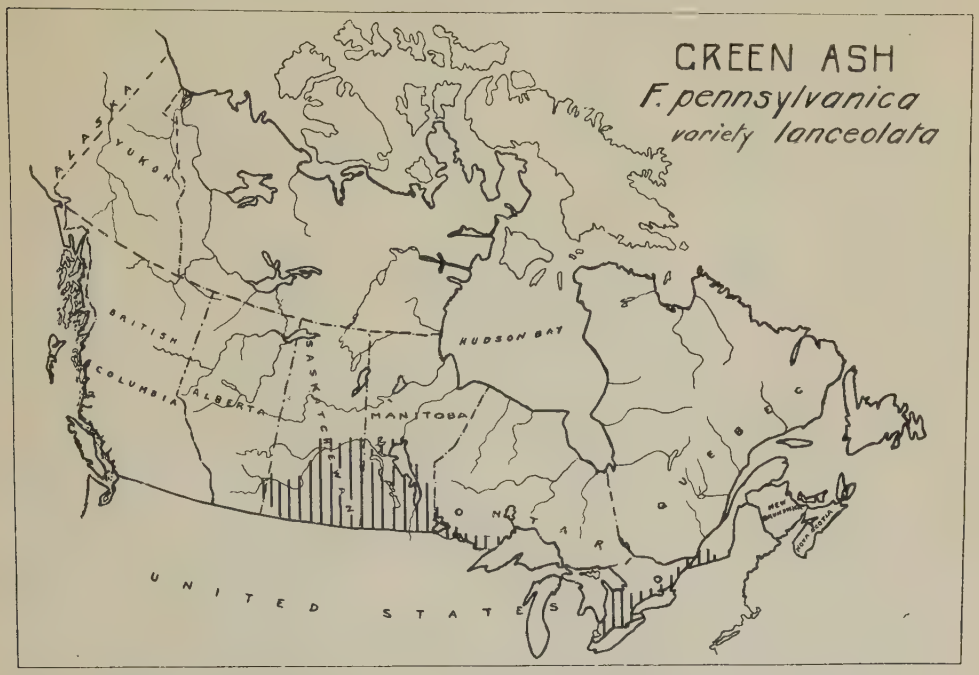
or coarser than those of the green ash. The sets of buds along the twigs occur more frequently than is the case with the white or black ashes.

The winter buds are covered with red hair and are darker and smaller than those of the white ash.

The leaf is composed of seven to nine leaflets and is 8 to 10 inches long. The undersides of the leaflets and their stems are hairy. Their margins are slightly toothed but often smooth below the middle.

The fruit is a winged seed 1 to 2 inches long, shorter than that of the green ash. The seed-bearing portion is rounded in cross-section. The wing is usually pointed and not notched, and almost surrounds the seed.

Red ash, when sawn into lumber, is usually used as a substitute for white ash. It is weaker, more brittle, and liable to discolorations and defects.



Fraxinus pennsylvanica Marsh. var. **lanceolata** (Borkh.) Sarg. **Green Ash**

Other common name: White ash*.

French name: Frêne vert.

In Canada the green ash is distributed from the western portion of southern Quebec westward along the St. Lawrence river valley to Georgian bay, also from the west side of lake Superior throughout the southern portion of the Prairie Provinces.

It inhabits the banks of streams and bottom-lands but is sometimes found growing on the uplands. It is a small tree, commonly 30 to 40 ft. in height and rarely going over 50 ft. It forms a low, rounded head with a short, clear trunk.

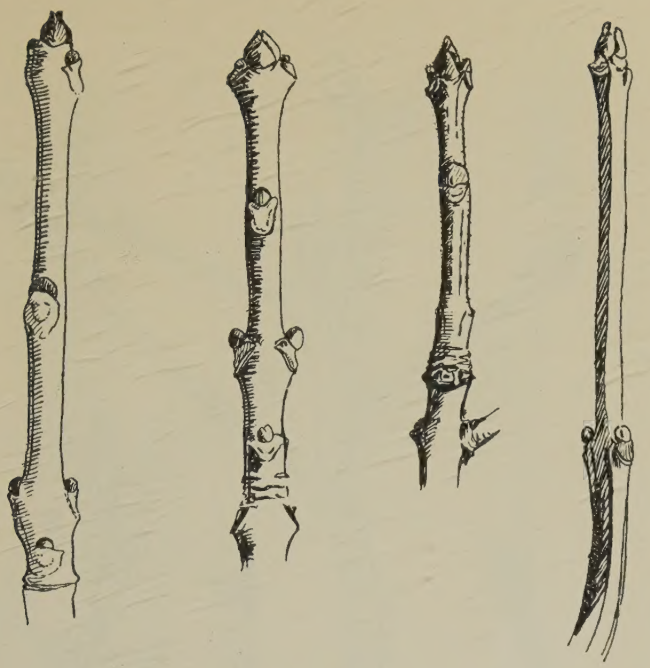
It is a fairly rapid-growing tree and very hardy, and on this account is extensively used in the prairie towns and cities of Canada for street and ornamental planting.

The green ash is considered to be a variety of the red ash. It differs from this tree mainly in the smoothness of its branches, leaves, and stems. The winter buds, too, are very nearly hairless. The leaflets are somewhat narrower and shorter, and the fruit is often longer than that of the red ash.

The wood of this tree is sometimes used as a substitute for white ash.

ASHES (*Fraxinus*)

	WHITE (*F. americana*)	GREEN (*F. pennsylvanica* var. *lanceolata*)	RED (*F. pennsylvanica*)	BLUE (*F. quadrangulata*)	BLACK (*F. nigra*)
BARK	Bark fissured. Ridges form diamond-shaped hollows. Usually darker than that of green ash.	Bark fissured and similar to the white.	Bark fissures somewhat finer than those of the white.	Light grey with small, thin, closely oppressed scales The cut bark exudes a resinous juice which turns blue on exposure.	Grey and soft scaly, i.e. it crumbles somewhat when the surface is rubbed with the palm of the hand.
TWIGS	Smooth and coarse. Upper margin of the leaf-scar more nearly surrounds the bud than in the case of the red ash.	Smooth-downiness does not remain on the new twigs throughout the winter as with red ash. Finer twigs than the white or red.	Downy. Finer than those of the white or black and coarser than those of the green. Sets of buds occur more frequently along the twig than in case of white or black.	Young twigs more or less four-angled in cross-section.	Smooth and coarse. The upper margin of the leaf-scar raised to partly cover the bud.
WINTER BUDS	Rusty-brown, large and smooth.	Few scattered hairs.	Covered with reddish hair. Darker and smaller than those of white.	Dark reddish-brown and slightly hairy.	Black and narrower than those of white.
LEAVES	Margin of leaflets usually smooth. Stalked, not hairy beneath. Darker green than those of green ash.	Leaflets narrower and shorter than those of the red ash. Smooth beneath. Short stems. More yellowish than those of white.	Margin slightly toothed, often smooth below the middle. Underside hairy. Leaflets with stems, sometimes without.	Margin sharply toothed with coarse incurved teeth. Leaflets have short stems. Midrib hairy beneath.	Margin of leaflets slightly toothed. Leaflets stemless and not hairy.
FRUIT	Wings narrow and wedge-shaped, attached to the end of the seed and not notched as a rule. Seed body round in cross-section.	Very much like that of red ash except that it is often slightly longer and sometimes broader	Wings almost surround the seed, usually pointed and not notched at the tip. Seed body round in cross-section.	Wing very wide, blunt, notched at the end, surrounds the seed and is frequently twisted.	Wing broad and surrounds the seed, end squarish and usually notched. Seed body flat in cross-section.



Ash Twigs
(reading from left to right)
Black ash (*Fraxinus nigra*). White ash (*Fraxinus americana*). Red ash (*Fraxinus pennsylvanica*). Blue ash (*Fraxinus quadrangulata*).

THE CASCARA TREE

There are three species of *Rhamnus*, generally known as buckthorn, native to North America, but the cascara is the only one which grows in Canada.

Rhamnus Purshiana DC. **Cascara**

Other common names: Barberry, bearberry, wahoo, buckthorn.

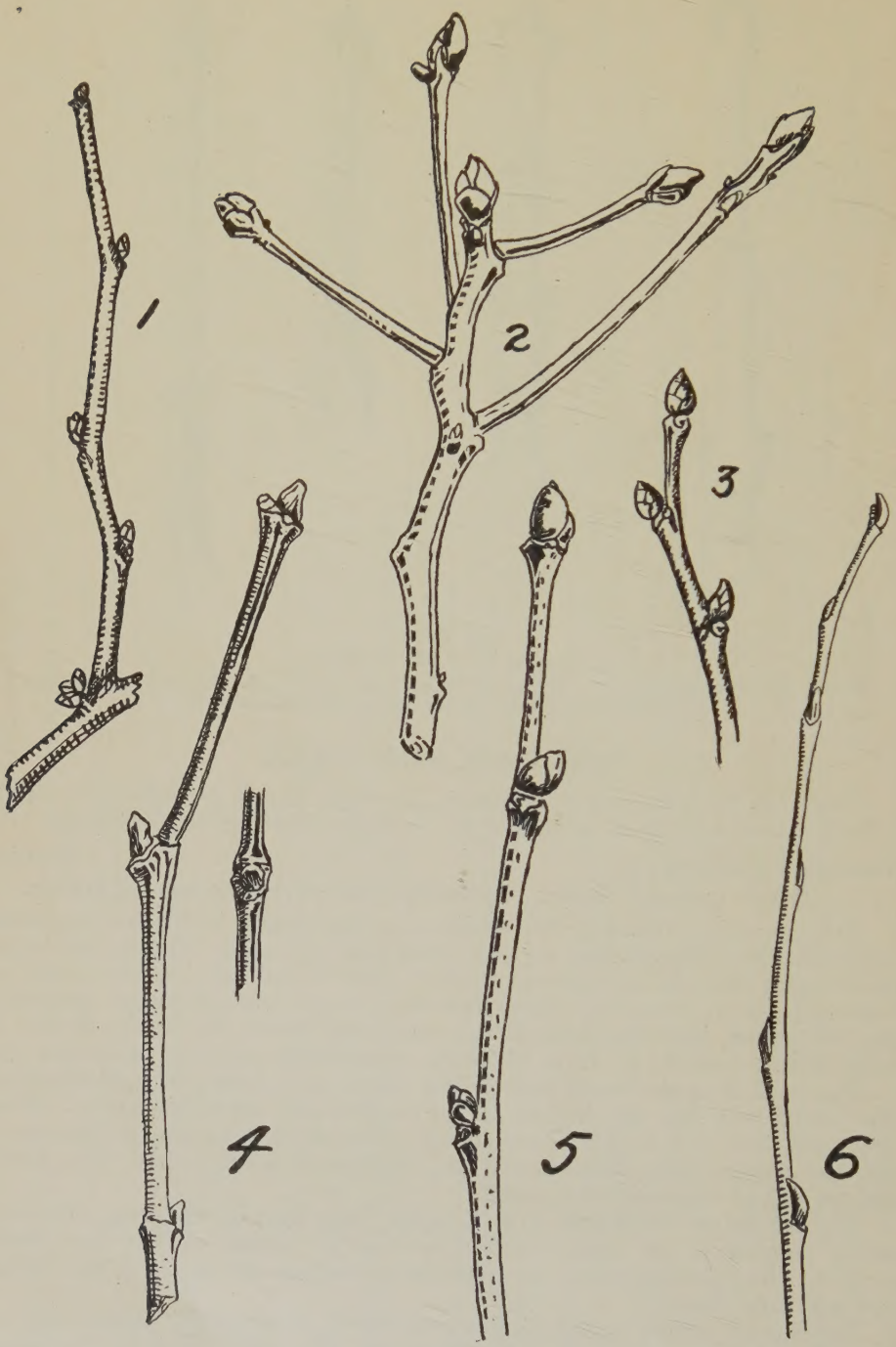
The cascara is found in the southern coastal region in British Columbia, usually on rich bottom-lands, in association with red alder, Western red cedar, and Douglas fir. It is reported to have been found also in the woods at Revelstoke. It is frequently shrub-like with several large branches separating near the ground, but more often it is a small tree 20 feet, or, rarely, 30 feet in height with a diameter of 12 to 15 inches, occasionally reaching twice that size.

The bark is rarely more than $\frac{1}{4}$ inch thick, dark-brown to light-brown or grey, tinged with red, and broken on the surface into short thin scales. When freshly cut, it is of a bright yellow colour, becoming dark-brown on exposure to light, has a bitter taste when chewed, and colours the saliva yellow. The winter buds are naked and hoary-tomentose.

The leaves are deciduous, 2 to 7 inches long, broadly elliptical, obtuse or bluntly pointed at the apex, rounded or slightly cordate at the base, finely serrate or often nearly entire; the veins are prominent and on the lower surface there are short hairs.

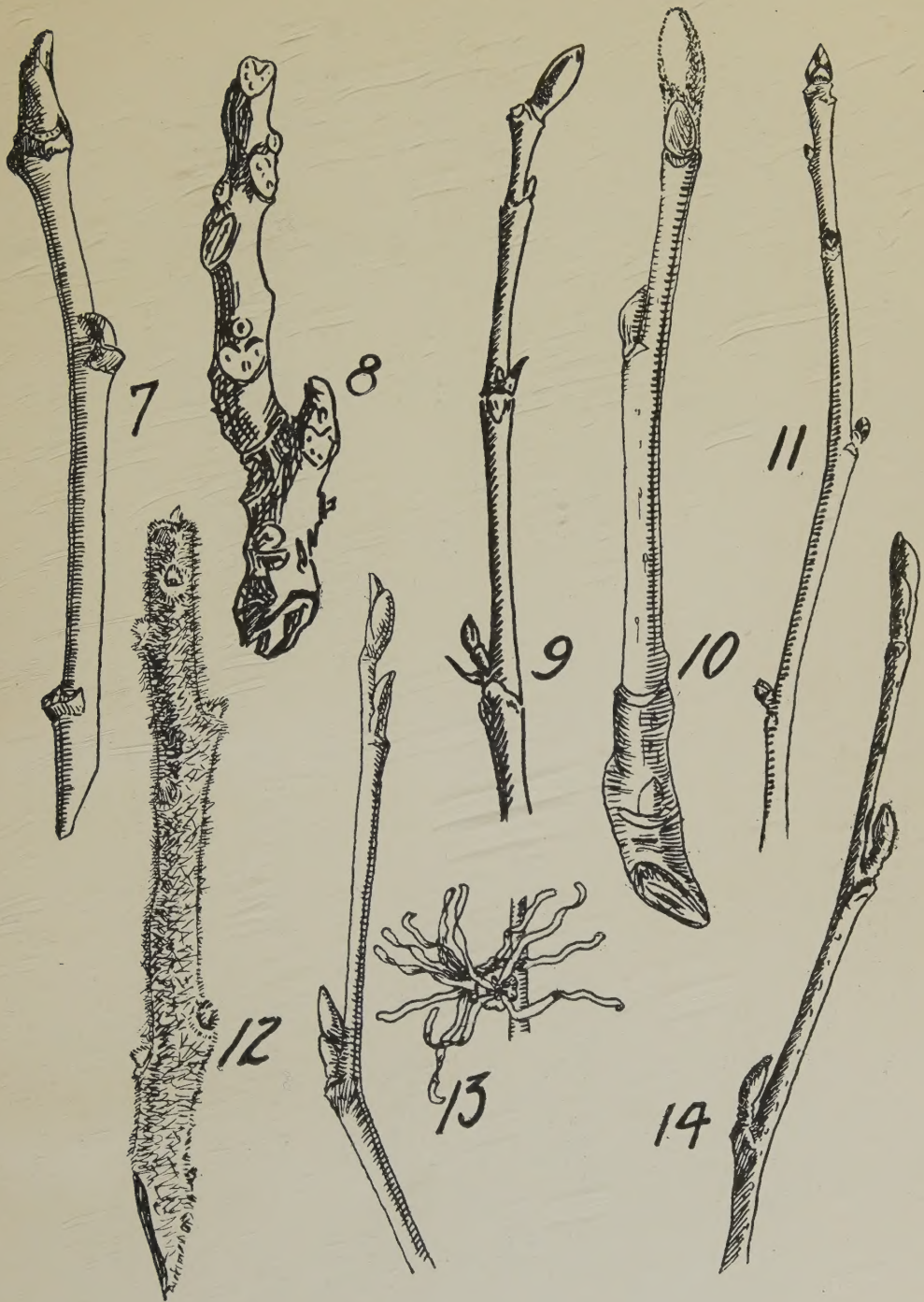
The flowers, which appear in June, are small, of a greenish colour, and are borne in clusters near the ends of the branches. The round black berries, which ripen in August or September, are somewhat sweet and very attractive to birds.

The cascara is a valuable tree on acount of the medicinal qualities of the bark, which is collected in commercial quantities and sold to manufacturing druggists.



MISCELLANEOUS TWIGS

1 Redbud (*Cercis canadensis*). 2 Sassafras (*Sassafras variifolium*). 3 Mulberry (*Morus rubra*). 4 Sycamore (*Platanus occidentalis*). 5 Basswood (*Tilia glabra*). 6 Willow (*Salix*).



MISCELLANEOUS TWIGS

7 Mountain ash (*Sorbus americana*). 8 Coffee-tree (*Gymnocladus dioica*). 9 Tulip tree (*Liriodendron Tulipifera*). 10 Magnolia (*Magnolia acuminata*). 11 Black gum (*Nyssa sylvatica*). 12 Sumach (*Rhus typhina*). 13 Witch hazel (*Hamamelis virginiana*): twig and flower. 14 Alder (*Alnus*).

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